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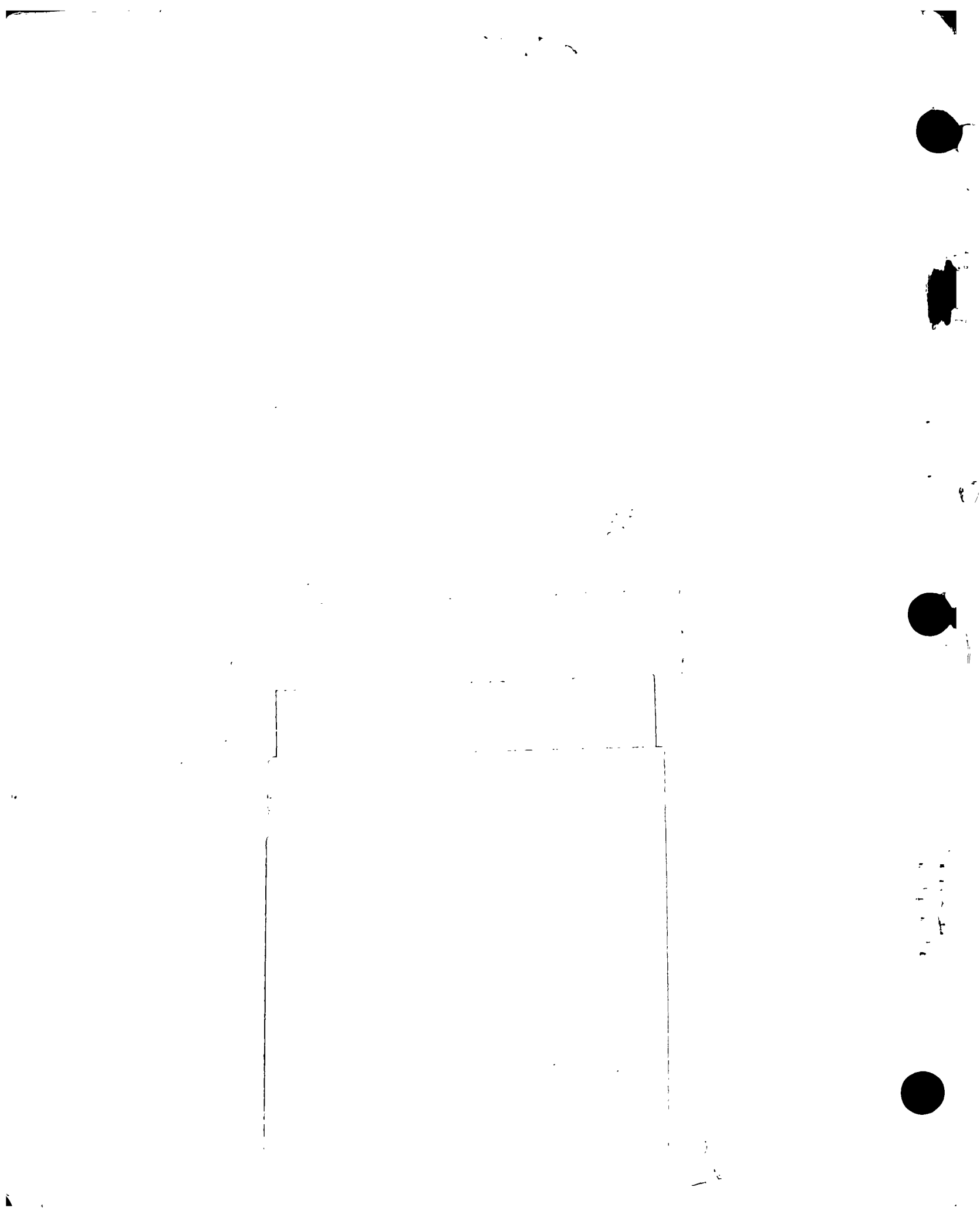
DEPARTMENT OF THE ARMY FIELD MANUAL

JUNGLE OPERATIONS

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FIELD MANUAL

No. 31-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 26 September 1969

JUNGLE OPERATIONS

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CHAPTER 1

INTRODUCTION

1-1. Purpose

This manual provides doctrinal guidance to commanders, staff officers, and other personnel concerned with tactical operations in jungle areas.

1-2. Scope

a. This manual describes the common as well as the distinguishing characteristics of the three major geographical jungle areas of the world that exist in Southeast Asia, Latin America and Africa. It discusses the characteristic effects of jungle conditions on troops, equipment, organization, and operations. It defines the role of the combat, combat support, and combat service support forces and discusses the specialized training requirements for conduct of operations in a jungle environment.

b. The material presented is applicable to operations in limited and general war and in stability operations. It is directed primarily to operations at brigade level and lower. The basic considerations of division level operations will be essentially the same as those in all areas of the world. Commanders and staff officers at all levels must understand and appreciate the effects of the jungle environment on operations at brigade level and lower and carefully consider them when

planning each operation. Unless otherwise specified, the material is applicable to both nuclear and nonnuclear warfare.

1-3. Operational Environment

As outlined in FM 100-5, the operational environment will, on occasion, impose certain limitations on the freedom of action of commanders at all levels. Such restrictions are normal and will occur in all forms of military operations. The restraints imposed in general war, however, will be less frequent and less specific than those imposed in limited or cold war.

1-4. Changes

Users of this manual are encouraged to submit recommended changes and comments to improve the manual. Comments should be keyed to the specific page, paragraph and line of text in which change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications) and forwarded direct to the Commander, U.S. Army Forces Southern Command, ATTN: Combat Developments Office, APO New York 09834.



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CHAPTER 2

THE JUNGLE

Section I. GENERAL

2-1. The Tropical Zone

The tropical zone lies between the Tropic of Cancer and the Tropic of Capricorn (23.5 degrees north and south of the equator). Within this zone there are such diverse environmental conditions as snow-capped mountains, barren deserts and rain forests. This manual is concerned with only that part of the tropics where the temperature and relative humidity remain high throughout the year. Areas within this part of the tropics are considered to be the humid tropics and it is in the humid tropics that the jungle environment is found.

2-2. The Jungle

For the purpose of this manual, jungle is defined as an area located in the humid tropics wherein the land is covered with such dense growth of trees or other types of associated vegetation that it impedes military operations and tends to obstruct military lines of communication. Tropical vegetation in jungle areas includes lowland and highland tropical rain forest, dry deciduous forest, secondary growth forest, swamp forest and tropical savannas. Jungles are confined to three major areas known as the American, the African, and the Oriental jungles. Figure 2-1 gives a general view of the jungle areas of the world.

2-3. Principal Jungle Areas

a. The American Jungles.

(1) *Amazonian*. Formed by the extended Amazon basin and its major tributaries, the Amazonian is the world's largest jungle area. It includes the Guianas and southern Venezuela, extending to the Andes on the west, and as far south as the Gran Chaco of Bolivia, Paraguay and Argentina. The Tupi Forest is a separate jungle area within this subdivision and lies along the eastern coast of Brazil extending from just above the hump where the continent juts farthest east to a point on a level with Rio de Janeiro.

(2) *Greater Colombian*. This jungle area extends from northern Ecuador (north of the Humboldt Current) through parts of Colombia, Venezuela and into the Isthmus of Panama.

(3) *Central American*. North from Panama, the Central American jungle spreads to the eastern side of the Sierra Madre Oriental of Mexico and as far north as Tampico. The jungle areas of the Antilles are also included within this subdivision.

b. The African Jungles.

(1) *West African*. Beginning south of Dakar, the West African jungle increases in depth and length as one travels southward and eastward around the continental bulge until the higher land in Sierra Leone is reached. Another belt stretches east to the western Camaroon border.

(2) *Equatorial Africa*. Beginning in Camaroon, the jungle stretches to the great barrier of Ruwenzori, and then extends southward across the Congo to the west of Lake Tanganyika.

(3) *East and Central African*. Formed by a few widely separated small forests and several island areas, the largest part of this area lies in northern Rhodesia south of Lake Tanganyika. Another portion lies along the west shore of Lake Nyasa and a third in the heart of northern Mozambique. Many scattered patches of jungle are found in the low altitude valleys along the coastal region of Tanzania and Mozambique, while highland jungles can be found on Elgon, Kenya and Kilimanjaro. Also included in this jungle subdivision is a strip on the eastern side and northern tip of the island of Madagascar, confined to the mountain areas of the nearby islands between the mainland and Madagascar.

c. The Oriental Jungles.

(1) *Indian-Ceylonese*. This area contains a strip along the west coast of India known as the Ghats. The jungle continues along the southern tip and up along the East Coast of India into East Pakistan and is resumed in Ceylon.

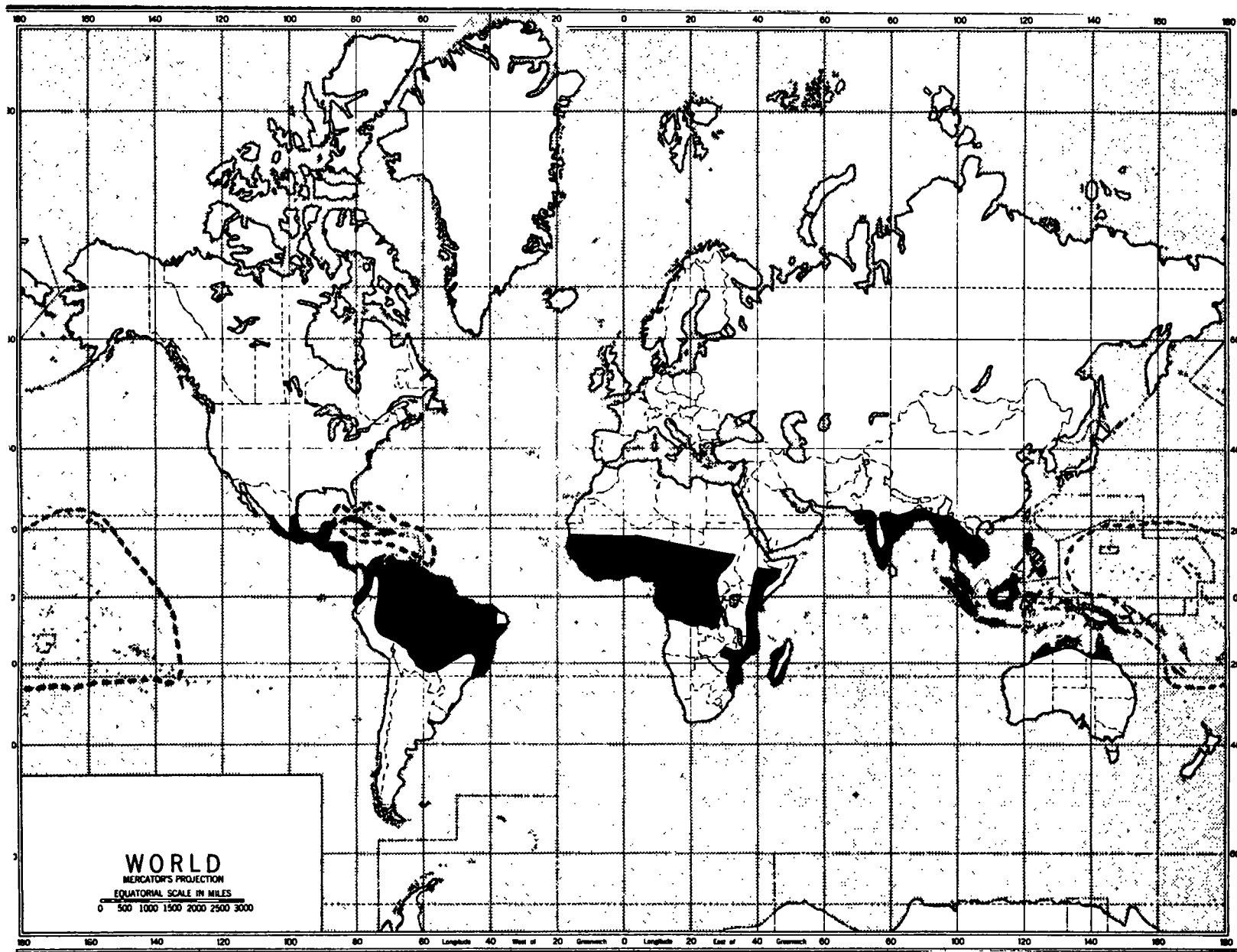


Figure 2-1. Jungle areas of the world.

(2) *Southeast Asian*. Stretching from the eastern slopes of the Himalayas (known as the Khasi Hills in the state of Assam), this area continues downward through Burma, Thailand, Vietnam, Cambodia, Laos and the Malay Peninsula.

(3) *Pacific Islands*. This subdivision includes Indonesia, the Philippines, and the smaller island groups containing jungle areas.

Section II. JUNGLE ENVIRONMENT

2-4. General

This section outlines environmental factors which must be considered in planning and conducting jungle operations. It includes a description of climate, terrain, vegetation, soils, and animal life. Descriptions herein are not exhaustive. Where supplemental detail is needed, specific area studies should be consulted such as the military geographic chapters of the *National Intelligence Survey* and the Tactical Commander's Terrain Analysis Map of the country of interest.

2-5. Climate

a. General. The dominating features of jungle areas are a high and constant temperature, heavy rainfall during the greater part of the year and oppressive humidity. Seasonal changes of temperature are insignificant compared with seasonal variation in rainfall. The year has no summer or winter, only cyclic wet and dry seasons. In some jungle areas, such as Singapore and many Pacific islands, climate variations are so slight that there are no seasons. Within complex vegetational communities such as a tropical rain forest, microclimates exist, some of which differ greatly from the standard climate of the same locality. For climatic details, see TM 1-300.

b. Temperature. Although seasonal variation in temperature increases gradually as one moves away from the equator, in the lowland humid tropics the mean annual temperature seldom varies for more than 5°, averaging between 78° and 82° Fahrenheit (F.) with extremes of 64° and 95° F.

c. Rainfall. The main factor conditioning all tropical climates is rainfall. In general, the seasonal distribution of rainfall within the tropics is associated with latitude. At the equator, rain falls during all seasons; as the distance from the equator increases, there is a distinct dry and wet season for each year. Although rain occurs during the relatively dry season, it is less in quantity than during the wet season. Rarely gentle or of long duration, tropical rain is often accompanied by thunder and lightening. Tropical rainfall is also relatively constant in its daily timing, usu-

ally occurring in the afternoon or early evening. For a given year, rainfall generally totals more than 60 inches.

d. Atmospheric Humidity. The relative humidity in a tropical rain forest area averages between 65 and 75 percent during the day and over 90 percent (near saturation) at night. The nature of the vegetation, the dank moistness of the surface soil, and the manner in which books, fabrics, and other materials become moldy unless frequently exposed to wind and bright sunshine, are all indicators of the high average relative humidity.

e. Wind. In tropical areas, wind velocities are lower than in temperate areas and violent winds are less frequent. Mean annual wind velocities average less than 3 miles per hour and seldom exceed 8 miles per hour, and their major influence affects only the upper canopy. Radical wind variations occur during typhoons, cyclones, and hurricanes; however, such disturbances are confined to certain tropical areas.

f. Light. The length of tropical day and night are almost equal, varying by little more than an hour at the outer limits of the tropical zone. Near the equator, cloudless days are rare. Cloudiness decreases as one moves north or south of the equator.

g. Microclimate. Climatic conditions on the ground, in even a small patch of jungle, may not resemble those above the canopy. In some jungle areas, the canopy is so dense that it provides a cover within which the jungle develops its own miniature climate or microclimate. In such an environment, the sun may be shining brightly above the canopy, while a brisk shower may be in progress at ground level. The canopy not only intercepts and redirects a considerable proportion of the rain, it also shelters the jungle from the wind, preventing a sharp rise and fall in temperature. Finally, the canopy diffuses the interior light, tinting it green and rendering it considerably less intense on the forest floor than on the surface of the canopy.

2-6. Jungle and Associated Terrain Features

The various types of jungle are classified by distinct vegetational types; however, transition from one type to another tends to be gradual rather than sharp. Vegetational types are numerous, and they tend to intermingle which complicates identification of jungle vegetation. In some areas this difficulty is not encountered because the transition from one type vegetation to another type is distinctive (fig. 2-2). Savanna grass is one such form, commonly found along the fringes of dry deciduous forests.

a. General. Most lowland jungles are located in areas varying from sea level to 2,000 feet of elevation, bordering on bodies of water and consisting of alluvial plains and swamps. Highland jungles are normally found in areas ranging from 2,000 to 13,000 feet above sea level. They are

characterized by steep, slippery slopes, and sometimes by steep-sided gullies and ravines which have been cut by torrential rains. The presence of numerous ridges establishes the existence of a many-branched drainage system which, in turn, causes a rugged and complex terrain structure. The streams and rivers draining these ridges often have steep, almost vertical banks and are swift, deep and difficult to cross. During heavy rains, such streams and rivers may rapidly become raging torrents. Despite the profusion of heavy vegetation, with few notable exceptions (such as Java), jungle soil is poor.

b. Tropical Rain Forest. Tropical rain forests are found in areas where the rainfall averages as much as 80 inches during the year. Although a so-called dry season may occur, there is still sufficient rain to sustain the growth of the rain forest.



Figure 2-2. Aerial view of transition from marsh to lowland rain forest.

(1) *Lowland tropical rain forest.* This term is generally applied to tropical rain forest occurring in elevations below 2,000 feet and consists mainly of trees, the tallest of which range between 150 and 180 feet. While these trees are usually 10 to 20 feet apart, they often appear to be much closer together because of their buttresses. The tree trunks are usually straight and slender and without branches for the first 100 feet. Then the branches spread out and interlock to form the upper stratum of the rain forest commonly known as the canopy (fig. 2-3). In some jungles, the canopy is composed of two or three successive levels of vegetation, which is generally filled with foliage. Beginning at a height of 20 to 25 feet from the ground such a canopy blots out the sun from the forest floor which, consequently, supports relatively little undergrowth (fig. 2-4). Only on river banks or in clearings

where more sunlight reaches the ground is there dense undergrowth which is often impenetrable. However, in the interior of a virgin forest, especially in well-drained areas, movement is less difficult. Horizontal visibility is obstructed by the tree trunks and by the leaves on the thick vines which ascend to the forest canopy like cables. Heavy rainfall throughout the year supports this type of forest; the ground is nearly always wet and slippery, and the humidity remains high even during the hottest part of the day.

(2) *Highland tropical rain forest.* The gradual transition from lowland to highland tropical rain forest occurs in areas between 1,650 and 2,300 feet in elevation. Highland tropical rain forest (also known as cloud or moss forest) terminates at various altitudes, depending upon its exposure to wind and rainfall; in continental interiors it may terminate at 13,000 foot elevations.



Figure 2-3. The jungle canopy. The interconnected system of tree limbs forms a veritable roof over the jungle floor.

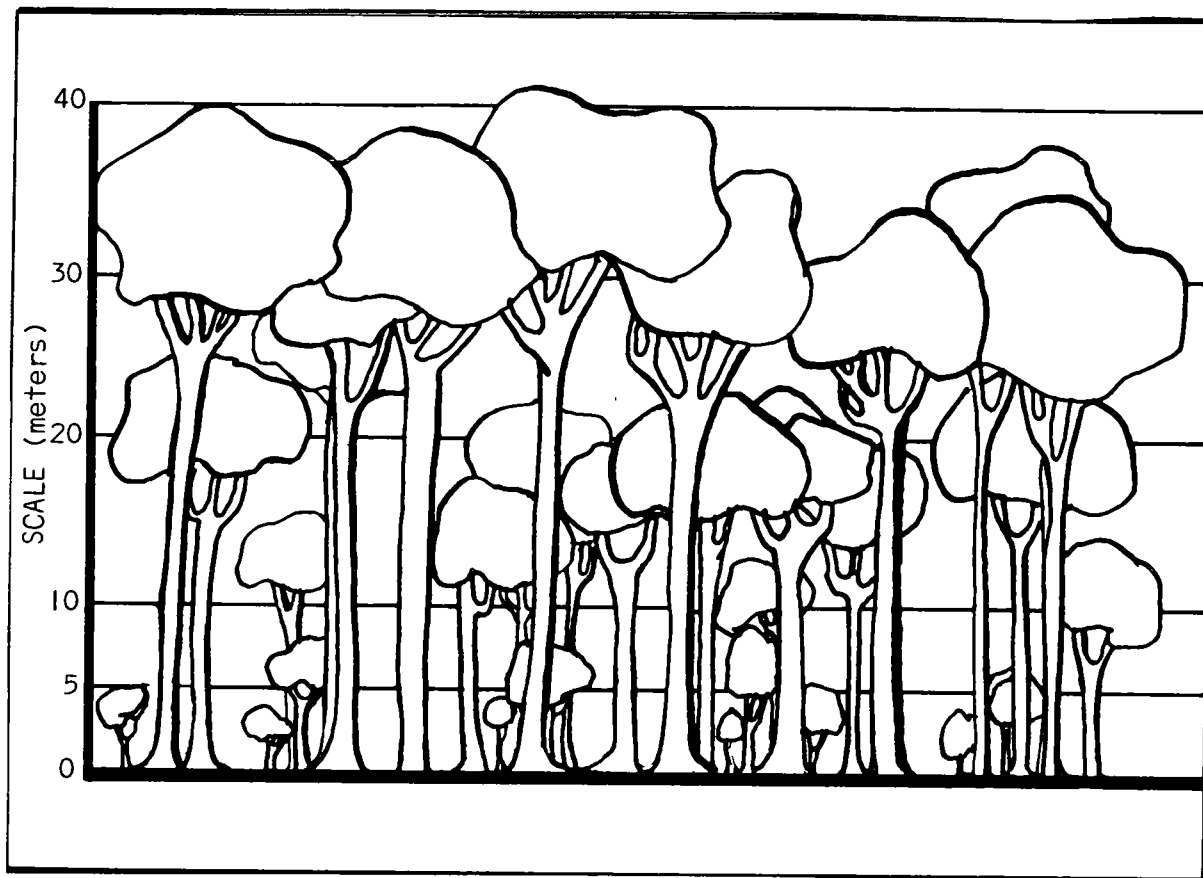


Figure 2-4. The jungle canopy (three levels).

Many characteristics of the lowland tropical rain forests also apply to the highland tropical rain forest. While trees dominate, they are smaller in height and lack buttress roots; there is also extensive fern growth. Most vegetation, prominent rock formations, and the ground itself are covered with moss or a heavy slime. Although the temperature may drop to 60 degrees, the humidity remains high. Animals, insects, and birds are scarce. Movement in this type of forest is extremely arduous and hazardous since the slopes are usually steep. The ground is slick and deep layers of ground moss often cover over hidden chasms and ravines. At higher altitudes the mountains are often shrouded by a damp mist which substantially reduces visibility.

c. Tropical Deciduous Forest.

(1) In some parts of the tropics there is a true dry season, lasting from three to six months, with almost no precipitation. Most of the trees in this area are deciduous, that is, they shed their leaves for a month or more. Although the leaves begin to fall gradually at the beginning of the dry season, the trees rarely become completely bare. Much of the tropical Asian forest is a decid-

uous forest subject to alternation of dry and wet seasons of approximately equal length.

(2) The upper canopy of a primary deciduous forest is generally formed by 100-foot trees. Where the canopy is continuous, there is little undergrowth; where the canopy breaks, the undergrowth becomes dense, comprising thorny shrubs, knife-edged and saw-toothed grasses, and spiny vines. Even during the dry season this undergrowth reduces horizontal visibility to 5 to 20 meters. During the rainy season, climatic and soil conditions within this kind of forest are nearly identical to those in the tropical rain forest. During the dry season, the ground becomes arid and hard and temperature and humidity fluctuate more than in the tropical rain forest.

d. Secondary Growth Forests. Wherever tropical rain forests or tropical deciduous forests are cleared and later abandoned, a secondary jungle growth results. Because of exposure to sunlight, these areas are rapidly overgrown by dense bushes and shrubs and climbing plants. Gradually, the composition of this forest becomes more complex, tending to approach its original nature. Because of uncontrolled cultivation, usually by

primitive peoples, secondary forests in various stages of development have replaced a substantial percentage of virgin forest in most jungle areas and are invariably more difficult to traverse (fig. 2-5 and 2-6).

e. Swamp Forests.

(1) *Mangrove swamp.* Extensive mangrove swamps occur in tropical coastal areas which are subject to tidal floodings. This type of forest is generally found in the soft mud around river mouths, deltas, inlets, along shallow bays on

small islands, and upstream as far as the tidal influence is felt. Closely spaced trees with thick stilt roots (tent shaped) that extend as high as 10 feet above the ground form a considerable barrier to movement. Usually the ground is covered by standing water. The steeply arching roots hamper horizontal visibility and create an extremely slippery surface. On the inland periphery where the water is less saline, mangrove swamps are usually bordered in many places by marshes. Mangrove species can usually be identified by the color of their bark, an important factor, since



Figure 2-5. Secondary growth.



Figure 2-6. Dense secondary growth along a jungle road.

differences involve growth intensity, subjection to flooding and relative size of aerial roots, all of which have an effect on movement.

(a) *Red mangrove*. Red mangrove grows in deeply flooded areas and has both aerial roots which drop to seek water, and ground roots which branch out in a tangled tent-shaped mass, forming a formidable barrier (fig. 2-7).

(b) *Black mangrove*. Black mangrove does not produce the maze of tent-shaped ground roots usually associated with red mangrove swamps, making movement easier than in swamps of red mangrove (fig. 2-8).

(c) *White mangrove*. Of all mangrove species, the white mangrove, which actually appears gray in color, presents the fewest barriers to



Figure 2-7. Red mangrove.

ground movement. White mangrove generally stands further apart than other species and has no tent-shaped mass of roots (fig. 2-9).

(2) *Palm swamp*. Palm swamp is generally characterized by flooded ground and a sparse canopy of overhanging trees. The most common plant association is *Manicaria* palm and a large fern of the genus *Gerostichum*. Usually found with other kinds of jungle vegetation but also occurring in dense stands, *Manicaria* palm grows in reasonably traversible shallow water. The *Manicaria* palm has a short, thick bole which has been known to hang up tracked vehicles. *Acrostichum*, which is a beautiful fern, normally stands alone in deeper water because of its tendency to choke out other plants (fig. 2-10).

(3) *Catival swamp*. Catival swamp derives

its name from the Latin American catival or catival tree. Found in some jungle areas, the catival tree produces a high, closed canopy of branches which shuts out the sunlight and retards the growth of other vegetation. The catival growth is often dry; however, when exposed to flooding, the area is commonly referred to as catival swamp.

(4) *Coastal thicket*. Coastal thicket is found along sandy beaches at or near sea level. Dense and difficult to traverse, the coastal thicket is a mixture of scattered coconut palm trees and salt-tolerant shrubs (fig. 2-11 and 2-12).

f. Associated Terrain and Vegetation.

(1) *Marsh*. Marshes generally are found in areas where the water is not brackish enough for mangrove, yet too wet for most forest trees. Tropical marshes contain tough thick reeds



Figure 2-8. Black mangrove.

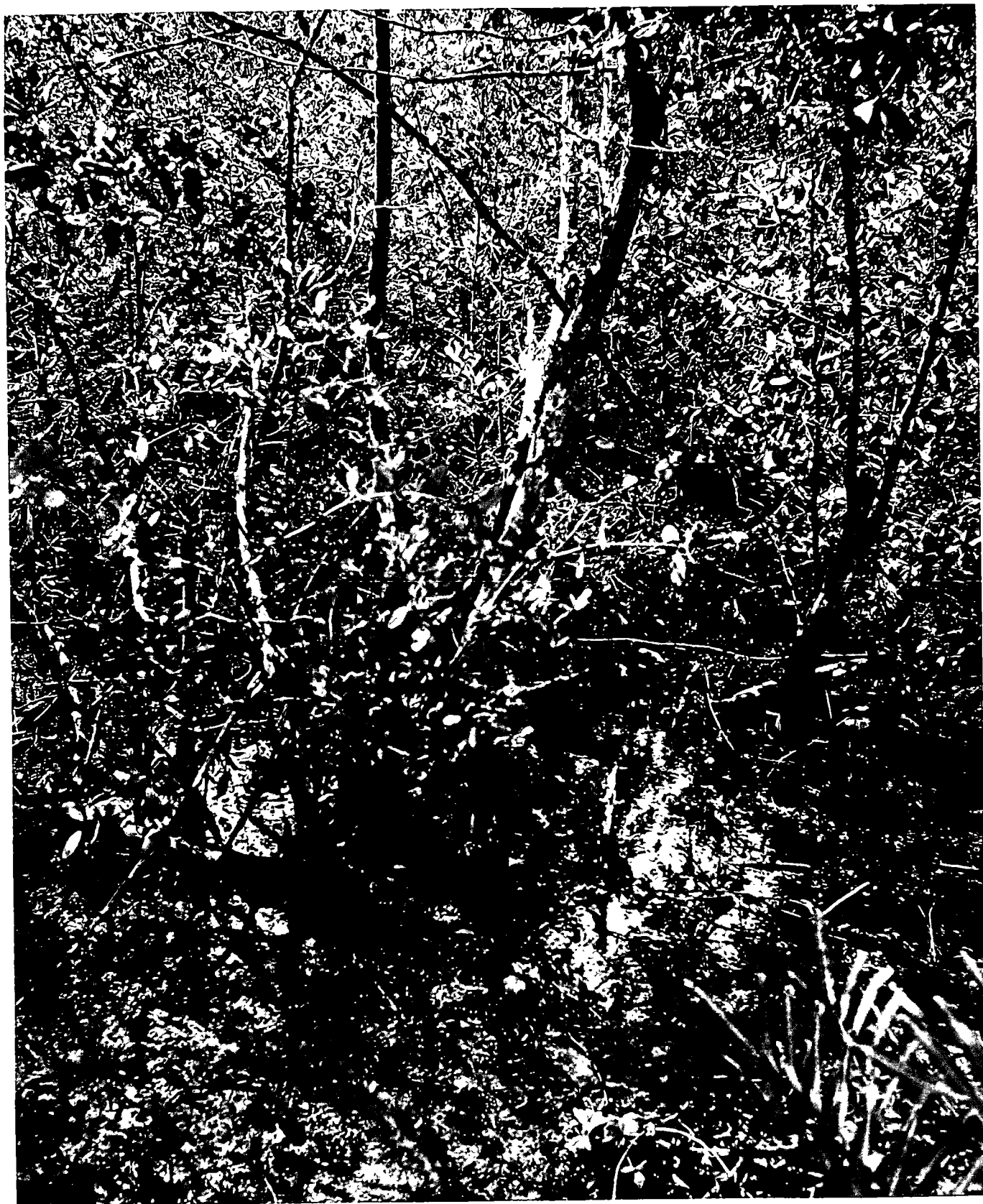


Figure 2-9. White mangrove.



Figure 2-10. *Acrostichum* palm swamp.

which grow to a height of 15 feet or more. While they offer less resistance to penetration than tree growths, marshes restrict observation at ground level to a few feet. In most cases, the footing in marshes is less secure than in other jungle growths (fig. 2-2).

(2) *Savanna*. Tropical savanna grasslands commence along the fringes of tropical forests. Trees are scarce, occurring only in scattered small groves or as isolated specimens. Often comprising the principal vegetation, savanna grass ranges from a height of 15 feet in well watered areas to as low as three feet in more arid sections. Although horizontal visibility in the tall grass is reduced to a few feet, the grass offers less resistance to movement than most other types of jun-

gle growth. The highest temperatures in the humid tropics are recorded in savanna areas, and the daily differences in both temperature and humidity are greater than in the other jungle growth (fig. 2-13).

(3) *Bamboo*. Bamboo grows in clumps of varying size throughout the humid tropics. Springy, hollow jointed bamboo stems vary greatly in circumference and length. Some growths attain a height of well over a hundred feet, limiting horizontal visibility to only a few feet. Movement through bamboo is slow and arduous because of its unusual strength of resistance. In addition, penetration of bamboo growths usually creates loud sounds as the bamboo stems are broken (fig. 2-14).



Figure 2-11. Coastal thicket.

(4) *Cultivation.*

(a) Throughout the tropical areas of the world a large percentage of farmers till the land in a relatively similar manner. Several acres of trees are cut during the rainy season and the logs and stumps are left in the clearing. These are then burned during the dry season. At the beginning of the rainy season the farmers punch small holes in the ground with pointed sticks, drop a few seeds in each hole, cover the seeds by stamping the ground with their feet, and wait for the crop to grow. After one or two years of use, a clearing is abandoned and a new clearing is made. This is commonly called "slash and burn" agriculture. Abandoned clearings usually contain a dense growth of scrub vegetation in which relics of former crops, such as bananas, may be found.

(b) The cultivation of wet rice is an important consideration in the more densely populated parts of potential jungle operational areas. Wet rice is grown both in the lowlands and on the hill slopes. In the lowlands rectangular fields separated by dikes two to four feet high are flooded during the growing season through a network of canals and irrigation ditches. On the hill slopes, terraces are constructed on which to grow the rice; dikes surround the terraced fields and the fields are flooded by gravity flow. Since most of these rice fields are fertilized by feces, accidental puncture of the skin while crossing these fields will generally result in an infection.

(c) In many jungle areas there are several types of tree crops, primarily rubber and coconut. These trees are generally grown in plantations, where the trees are planted at regularly



Figure 2-12. Coastal thicket.



Figure 2-18. Savanna.

spaced intervals and all underbrush has been removed. Having the appearance of well-tended parks, rubber and coconut plantations afford a welcome respite from the jungle but provide little ground concealment or cover.

2-7. Surface Materials

The soils of the humid tropics vary in structural, physical and chemical properties to at least the same degree as those of other climates. The correlation between soil and natural vegetation is always close, and tropical plant communities reflect differences in soil conditions no less faithfully than do those of temperate climates. Though varied in many of their properties, the majority of the soils of lowland jungles have certain important common characteristics: in color they are often bright red or yellow; in texture they are frequently clayey, sometimes loamy; and superficial layers are occasionally sandy. In spite of their lush growth (most of which stems from the hothouse environment), soils are generally low in vegetal nutrient content. Trafficability is generally poor, especially during rainy periods.

2-8. Animal Life

The animal population of jungle areas is abundant and diversified. Some are remarkable for their size, such as 30-foot pythons and anacondas, the quarter-ton land tortoises, giant scorpions and beetles. Ants, leeches, spiders, mosquitoes, and other insects are innumerable and are found everywhere from ground level to the tops of the tallest trees. Animal life is most abundant in the forest canopy, decreasing progressively in both species and number as they approach the forest floor. Environment involves five layers—the canopy, the middle tier, the surface of the ground, beneath the ground, and in the waters. Birds such as the parakeet, fruit pigeons, birds of paradise, toucans, and trogons live in the canopy. The forest canopy is also the habitat of monkeys, apes, sloths, iguanas, marsupials, squirrels, and a rich insect and reptilian life including snakes, spiders, centipedes and ants. Because of its unprotective character, the forest floor supports the least animal life. In savannas and secondary forests, which provide good shrub and bush cover, are found large animals such as deer, tapirs, wild pigs, lions, tigers and anteaters. On the floor of



Figure 2-14. Bamboo.

the tropical rain forest only lizards, grubs, termites and ants can survive. With the exception of monkeys, squirrels, snakes and lizards, the jungle canopy is virtually devoid of animal activity from mid-morning until about an hour before sundown. While life exists in the jungle during these hours, practically all wild life is resting under bark or logs, sleeping in the dense masses of vines or in the heads of palms, in holes in the ground, or in the rare patches of tall vegetation, usually near the water. Most animals in the jungle will not attack man unless they are frightened. There are a few exceptions. The Asiatic tiger, the Latin American Jaguar, and peccaries (commonly called wild boars) may attack unprovoked. These animals are in the minority and are rarely encountered. Even snakes will not usually

attack unless they are molested. The danger of snake bites is commonly exaggerated. At the time of publication of this manual, no U.S. Army personnel have died from snake bite since 1938, the year that records were first kept. Some reptiles, such as the crocodile will attack when provoked, and some fish, such as the Piranha of northeastern South America, will attack anything that moves. For the most part, the animals, other than insect types, that inhabit the jungle are not a significant hazard.

2-9. Diseases

Troops operating in the humid tropics will be exposed to a variety of diseases. The mosquito transmits malaria, yellow fever, dengue (breakbone) fever, filariasis (elephantiasis) and some

forms of encephalitis. Some typhus and plague are transmitted by insects such as the mite and flea. Scrub typhus is transmitted by a very small mite and plague is transmitted by the rat flea. Sleeping sickness is limited to Africa, since the necessary carrier, the tsetse fly, is not found in the jungles of Latin America and Asia. Diseases transmitted by infected water or food include typhoid fever and paratyphoid fever, hepatitis, bacillary dysentery, undulant fever (brucellosis) and amebiasis. Other diseases widespread in the tropics are malnutrition, tuberculosis, schistosomiasis (transmitted by a blood fluke), and a variety of intestinal parasites such as hookworms, and leprosy. Yaws, a contagious disease confined almost exclusively to the tropics, is characterized by skin eruptions which are spread by direct contact with infected people or by flies. Various types of fungi produce the most widespread infections. Constant exposure to high heat and high humidity cause most troops to harbor fungus. These organisms grow at an extremely rapid rate unless a constant effort is made to keep the body dry. Foot care is most important; however, fungus infections also occur quite commonly in the ears, on the hands and in the crotch area. Venereal diseases such as syphilis and gonorrhea are quite common in native villages. (For further information see FM 21-10 and the appropriate TB MED on treatment, clinical features, control and prevention of specific disease, such as TB MED 164 on Malaria.)

2-10. Natives

The natives of an area can provide valuable as-

sistance if they are made to feel that there is some reason for giving their help. It is necessary to become familiar with the customs, habits, and taboos of the natives before going into an area. By violating a sacred taboo, it is possible to alienate the natives in an area and, thus, cut off a source of intelligence and a supply of potentially willing workers who could be employed as scouts, guides, carriers, construction workers, and litter bearers. In dealing with the native population, all transactions should be conducted with the headman of a village or tribe. Although the use of host country or local interpreters can be advantageous, extreme care must be exercised in using them because of their possible unfamiliarity with our language. In their desire to be helpful and to maintain their favored position in the community or tribe, they may not indicate that they do not understand and they will provide the answers that they think are wanted. Therefore, it may often be more advantageous to use sign language directly with the headman or chief. The following should be considered when dealing with native populations:

- a. Be friendly but cautious.
- b. Be courteous.
- c. Respect customs, religious beliefs, and property.
- d. Offer gifts with prudence.
- e. Avoid threatening gestures.
- f. Do not molest women.
- g. Offer all assistance possible, especially medical aid.
- h. Do not confiscate food and belongings—pay a fair price for everything.

Section III. AMERICAN JUNGLES

2-11. General

The American jungles, or selva, are dominated by the Amazon basin, which contains about one-sixth of the world's jungles. Extending more than 2,000 miles from the South Atlantic to the base of the Andes Mountains, the basin encompasses a land mass nearly as large as the continental United States. The heart of the Amazon basin is the immense Amazon River system, an inland sea, which fans out from the Atlantic coast to the Andes. The Amazon and its tributaries are bordered by an extensive flood plain sometimes varying in width from 50 to 60 miles. Because of low elevation and poor drainage, the plain is frequently flooded, forming numerous swamps, called *paranas*, that sometimes cover

thousands of square miles of land. Upcountry, above the mouth of the River Xingu, sections of the Amazon flood plain are inundated for as long as seven months a year. The lower Amazon flood plain is usually under water from November through September. Bordering the Amazon flood plain are river bluffs averaging from 150 to 200 feet high. The remainder of the basin containing about 90 per cent of the Amazon region consists of a low plateau of rolling terrain with intervening valleys which gradually slope inward toward the Amazon River. Covered with tropical rain forests and extensive stretches of scrub brush and short grasslands (*campos*), the Amazon uplands are relatively well drained and generally free of swamps. Facing the Amazon basin, the

eastern foothills of the Andes form steep, dissected slopes and narrow valleys. These, together with intermittent swamps and dense vegetation, make land movement extremely difficult.

2-12. Climate

Climate in the Amazon basin and most of the Central American tropics is characterized by high humidity and a lack of seasonal variations. In general, humidity decreases with distance from the Atlantic Ocean. In Panama, humidity often reaches 95 percent or more at night, and more than 60 percent during the day. At Manaus, in the heart of the Amazon basin, humidity averages 78 percent. The highest temperatures prevail along the Guiana and Caribbean coasts. Average temperature along many of the coastal lowland regions of Central America is 80° F. Average temperature variations between the warmest and coolest months in the Amazon basin is 3°F. Lowest temperature in many sections of the Amazon basin are recorded about 4 a.m., usually in August, when temperatures drop below 60° F. Rainfall over the entire American jungle is generally abundant. In the Amazon basin, rainfall exceeds 80 inches in most sections. The Amazon "winter" (rainy season) lasts from January to June, with almost daily rainfall in the form of circumscribed showers that begin and end suddenly. During this period, inhabitants of the region are generally restricted to their homes as roads and trails are inundated and become practically impassable. The lower Amazon experiences a marked dry season from July to September. Nights in the Amazon basin are always brilliantly clear. In Central America, most rainfall occurs along the low, flat stretches of the Caribbean coast, where warm, easterly trade winds annually bring between 125 and 200 inches of precipitation. Most rain falls along the coast between May and November, followed by a drier season lasting from December to April. On the Pacific coast of Central America, rainfall is somewhat less, averaging between 40 and 100 inches annually.

2-13. Vegetation

Plant life in the Amazon basin is considered the most complex on earth—with as many as 3,000 distinct species per square mile; vegetation throughout the Amazon basin varies according to the rainfall. Along the Andean foothills, an average of up to 300 inches of rainfall supports a

dense tropical rain forest. Areas receiving less rainfall along the southern edges of the Amazon basin and in the Llanos along the northern edges of the basin are characterized by scattered savannas. In the tropical lowland areas of Central America, and particularly the West Indies, much of the original tropical rain forest has been altered by centuries of slash-and-burn agricultural methods. Some of these areas have been converted into permanent grazing lands, while other areas have reverted to secondary growth jungle which presents considerable impediment to movement. However, some large tracts of virgin rain forest still exist in Central America, particularly along the Mosquito Coast of Nicaragua. Central American coastal areas often include thickets of coconut palm, sea grape, and shrubs. Mangrove swamps border areas covered by salt water.

2-14. Animal Life

Because they cannot survive on the watery floor, most American jungle wild life is found in trees. In general, the American animals are smaller than those existing in the other tropical regions of the world. For example, monkeys of the Amazon basin never exceed 40 pounds in weight, and many are smaller than rats. The largest animals include tapirs, jaguars, which Brazilians call tigre onca, 10 to 20 foot boa constrictors, 25-foot anacondas, and 10-foot crocodiles and caymans. Tarantulas, scorpions, and rodents are also common, the largest rodent being the 100-pound capybara. Large fish such as the Piranyba, a 6-foot Amazon River catfish, plus numerous varieties of other fish, turtles, and reptiles inhabit the streams and swamps. Many Amazon streams contain the carnivorous piranha fish and the electric eel. Most wildlife, including snakes, avoid man and are seldom seen. There are few species of poisonous reptiles in the American jungles. Most dangerous are the large bushmaster and the common fer-de-lance. The coral snake, while extremely poisonous, is seldom a menace to properly dressed and trained personnel. In Brazil, none of the poisonous snakes can climb trees; however, in Central America, a green-colored palm viper lives in bushes and trees and is dangerous because it commonly strikes humans about the face and arms. The fer-de-lance is the only poisonous snake found in the West Indies. The most annoying wild life are the ever-present insects, such as the ihenni, a gnat size fly with a bite of fire. The Amazon area harbors millions of bats, including the vampire species. Stories of the aggressiveness of

bats are greatly exaggerated. Also roaming the Amazon region are wild pigs or pacas; when these animals are part of a herd, they can be vicious and fearless.

2-15. Population and Transportation

The jungle areas of the Americas are sparsely populated. The great mass of the Amazon basin is inhabited by primitive Indians, who perhaps number less than 10,000. Little is known of these people, as they usually avoid contact with the civilized population. The Auca tribe of eastern Ecuador is perhaps the most belligerent group. In many sections of the Amazon, small settlements still indicated on maps have long since been abandoned; the entire Amazon region contains fewer than 2,000 miles of roads and railroads. While the rainy lowlands of the Amazon basin greatly limit land transportation, the Amazon River provides an extensive water transportation system. Containing a fifth of all the world's river water, the Amazon and its tributaries can be navigated as far as Manaus by ocean liners grossing up to 10,000 tons. Steamers weighing up to 4,000 tons can continue on to Iquitos, Peru—a distance of 2,300 miles from the Atlantic Ocean. From

Iquitos, river boats can travel certain Amazon tributaries all the way to the base of the Andes. Large sections of lowlands along the base of the Andes have waterways that permit navigation by small boats. Since the Amazon itself is wild and not easily navigated, there are some limitations on water transportation. The rise and fall of the river, and some tributaries, often measures 40 feet. And, along the Andean base, many of the streams are interrupted by long stretches of rapids. Industry in the Amazon basin is practically nonexistent and the region is not self-sufficient in food supplies.

2-16. Diseases

As in other jungle areas throughout the world, malaria is the most widespread and deadly disease in the American jungles. Other tropical diseases—usually associated with unsanitary conditions and poverty—are prevalent in the area. An estimated 90 percent of the rural population of the Amazon basin suffers from intestinal parasites. Yaws are especially prevalent in the lower Amazon basin. For additional information on diseases, see paragraph 2-9.

Section IV. AFRICA

2-17. General

A standard estimate of the jungle area in Africa—equatorial rain forest and mangrove swamp—is 884,700 square miles, or 7.9 percent of the total area of the continent. If other forest areas are included, that is, the tropical deciduous forests and the Montane forests, then the estimate rises to approximately 1.4 million square miles or 12.6 percent. The largest body of jungle is found along the equator wherever rainfall is high, where the temperature range is small, and where the dry season, if present at all, is very short. Known as Equatoria, the center of this area lies in the Congo basin. In addition, a rain forest extends into the wettest parts of West Africa, primarily along the coastal regions. Although a marked dry season does exist there, it is too short to alter the constantly high humidity and temperatures. Equatoria and West Africa are discussed separately because, though the character of the vegetation is similar, the configuration of the forests is not, for the high density of population in West Africa has caused a change in the forest area.

2-18. Equatorial Africa

a. General. The heart of Equatorial Africa is the Congo basin, a vast shallow depression in the African plateau crossed by the Congo River and its tributaries and enclosed by uplands. The drainage area of the river is approximately 1.6 million square miles. Vast, sparsely populated, and relatively untouched, the rain forest which occupies much of the Congo basin and the area to the north resembles, in many respects, that of the Amazon basin. In addition to Congo (Kinshasa), the rain forest area covers parts of Congo (Brazzaville), Gabon, Cameroon, and Rio Muni as well as a narrow strip along the southwestern border of the Central African Republic. The coastal region of Equatoria consists of a narrow, low plain, extending about 40 miles inland in Congo Brazzaville, from 18 to 128 miles in Gabon, and only a few miles in the extreme south of Cameroon. The coasts are generally straight and sandy, often bordered with large lagoons. Inland from the coastal plain between Cameroon and Congo Brazzaville, the land rises abruptly to a series of hills,

mountains, and plateaus, all of which are parallel to the coast.

b. Climate. The keynote of the equatorial climate is monotony: constant temperature, constant humidity, and constant rainfall. In the western Cameroons and between the latitudes 2° and 3° North in the Congo, there is no dry season, and the annual temperature range is extremely small. The range of temperature between day and night does not exceed 10° or 15°. Moving both north and south from these latitudes the dry season becomes progressively longer, and the climate becomes progressively cooler and drier as one approaches the mountains. Total rainfall in the Congo basin varies between 50 and 70 inches; but on the coast a rapid change occurs from north to south—from 400 inches at the foot of Cameroon Mountain to 30 inches at the mouth of the Congo River, and dwindling to 10 inches at Benguela (Angola). The bulk of the rain is convectional, and over much of the Congo basin afternoon and evening thunderstorms are a daily occurrence during the rainy season and even during the so-called dry season, which may be as short as one to two months. (The dry season/seasons occur during June-July and/or December-January, depending upon the particular area.)

c. Vegetation. In spite of the poverty of the soils, the cumulative effect of high temperatures, humidity, and precipitation is a dense, lush vegetation with trees approximately 120 feet high and a canopy of thick leaves. Unlike the Amazon jungle, which is often described as extremely gloomy with little or no undergrowth, the floor of the Equatorial rain forest is a mat of almost impenetrable undergrowth and has considerable swamp areas. Often there is an understory of small trees, and in the more open parts there is a thick growth of herbs on the forest floor. Woody climbers, or lianas, are usually abundant, and many of the trees are supported by buttresses. A great variety of species of trees (as many as 200) can be found in a small area. In the heart of the basin the rivers form a jumble of branches linked with one another. These rivers often flow through a dense forest which is seasonally inundated. Throughout the rain forest the ground in those areas shaded from the direct rays of the sun is moist, if not wet, during the entire year. Variations in this pattern of vegetation are to be found along the coastal regions where mangrove swamps fringe the estuaries and lagoons. Towards the outer rim of the basin where the dry season becomes marked, the number of species of

evergreen trees diminishes, the proportion of deciduous trees increases, and there are patches of grassland. On the highlands of Cameroon in areas above 3,000 feet, the density of the jungle decreases and contains extensive bamboo thickets and broad areas of open grasslands, a condition which is also found in the East African mountain areas.

d. Population and Transportation. The rain forest area in Equatorial Africa has a low population density (some 10 percent of the entire Congo has less than one person per square mile) and has low soil fertility which discourages agricultural production (when the land is cleared of forest, the soil is rapidly leached by the heavy rainfall, and a long time is required for recovery). Development of any kind in the rain forest areas is impeded by the vast distances involved; generally, the more dense the forest, the smaller the villages and the greater the distance between them. Footpaths, usually only wide enough to accommodate a bicycle, lead from village to village and are maintained through the years by constant use. Roads are expensive to construct or maintain because of the torrential rainfall which washes out the roadbeds. Since the first roads built generally followed the old footpaths, many roads are now badly alined and graded. Because roads cannot always be efficiently drained and because their surface is often not waterproof, a large portion of the roads are usable only during the dry season. During the rainy season, roads are washed out and must be regraded in spots before they can be used. For these reasons, the second most important means of travel (next to paths) in the more dense regions of the forest is by water rather than by road. The majority of the population lives on the subsistence level, growing food crops on small cleared patches of land which are then left fallow for a period of years so that the soil may regain its fertility. Typical crops are cassava, maize, plantain (a relative of the banana), yams, manioc, tobacco, beans and oil palm. Because the soils are sandy and are poor in plant nutrients, the crop yield is extremely low. The majority of the populace do not eat fish or meat; thus the overall diet is inadequate.

2-19. West Africa

The topography of West Africa consists of a flat to slightly rolling coastal plain, 20 to 400 miles wide and generally less than 500 feet above sea level, which rises gradually to an inland plateau.

a. Climate. Temperatures are uniformly high

throughout West Africa; however, in the interior there tends to be a slight seasonal drop. In the coastal areas temperatures range from 77° to 82°F. In these areas, which coincide with the rain forest belt, the high temperatures combined with the constant high humidity cause considerable discomfort; rainstorms bring only temporary relief to the oppressive heat. For a short period during the winter when a monsoonal wind blows from the interior (the harmattan), the humidity drops slightly during the night, and the coastal peoples, acclimated to the damp, hot climate, feel an actual chill in spite of the high temperature. It is not unusual to see people shivering in 80° weather.

b. Vegetation. The vegetation covering West Africa is directly related to the patterns of rainfall. Two characteristics of this pattern are important. First, there is a progressive decrease in total annual rainfalls as one goes from south (the coast) to north (inland). For example, along the coastal area of Nigeria, the average annual rainfall is 110 inches; 65 miles inland, it decreases to 80 inches. The heaviest rainfall is found on the coast of Liberia, which receives 120 inches; at the inland boundary of that country (about 125 miles), annual rainfall declines to 60 to 80 inches. Secondly, the length of the rainy season decreases progressively going toward the interior. Along most of the southern coast the rainy season lasts from 11 to 12 months; inland 150 miles, it lasts only about 9 months. Different types of vegetation are found in belts which run parallel to the coast, according to the seasonal climate. Along the coast there is the narrow belt of mangrove woodlands and sand-bank grass forest with coarse grasses and screw pines. Mangroves fringe most of the estuaries and coastal swamps within tidal limits. The largest body of mangroves is found in the Niger delta area (Nigeria) where lagoons, creeks, and swamps form an intricate system of waterways. Swamp forests consist primarily of trees from 5 to 60 feet high, either standing on large stilt roots which lift the main stem of the trees above high tide, or having respiratory roots growing out of the tidal mud. Directly behind the mangrove swamp belt is the equatorial rain forest, also called evergreen forest. Beginning south of Dakar (Senegal), it follows the coast in varying depths, usually between 50 to 200 miles. This belt is broken only by an area known as the "Ghana dry belt", where the savanna extends to the coast. The rain forest is found between the lowlands and in areas up to 1500 feet elevation. In addition,

this type of vegetation grows along the banks of rivers flowing into the interior. Inland, the rain forest develops into an area covered by mixed evergreen and deciduous forest, becoming an area covered entirely by deciduous trees which shed their leaves during the dry season. The rain forest vegetation is similar in character to the Equatorial rain forest already discussed. The popular concept of a jungle exemplified by that found in South America and in Equatorial Africa, however, does not apply to West Africa. Not only has there been a considerable reduction in the total area covered by forests, but also, from one-third to two-thirds of what is forested now consists of inferior, secondary growth. In Sierra Leone, for example, only 5 percent of the original forested area remains, and even the mangrove swamps are being cleared and drained in an effort to turn them into rice paddies. Three factors tend to reduce the forest areas in West Africa: (1) the increasing population which forces the use of larger areas for subsistence plots and the adoption of a shorter fallow period for regeneration of the soil; (2) the extension of commercial crop production; and (3) the damage by fire. The last is particularly relevant to areas covered by deciduous forests, with the result that in some areas there is an abrupt transition from rain forest to grassland. In the rain forest belt itself, some areas are honeycombed with villages, agricultural clearings, and abandoned clearings. In addition, footpaths and broader trails lead from village to village and to the nearest public road. Another important factor is the peculiar legacy of the colonial system—major towns and government centers were established near the coast. Thus post World War II development of the transport infrastructure has been concentrated in the southern region of West African countries—in the heart of the rain forest belt. In Nigeria, Ghana, and Sierra Leone a large percentage of the population in the rain forest belt lives within ten miles of a major or secondary road.

2-20. Animals and Diseases

a. Animals. Africa is famed for its abundant and unique forms of wildlife. Although diminishing in number and extent, much of it still exists in savanna parks and in the rain forest areas, especially in Equatorial Africa where the dense and sparsely populated forests offer a refuge. In the Congo basin several varieties of gorillas, chimpanzees, monkeys, giant boars, and elephants are found, as well as dwarf buffaloes, an-

telopes, and the pygmy elephant. In West Africa, because of the increasing human population, game animals are not encountered as frequently as in the past; the larger mammals seek the more inaccessible parts of the dense forest. Elephants are still found in some western areas, especially Sierra Leone and the Ivory Coast. Occasionally an elephant is still seen in Eastern Nigeria, but is quickly hunted and killed because of the damage it causes to cultivated areas. Also found in parts of West Africa are the red buffalo, some species of antelope and wild hog, leopards, hyenas, and great variety of smaller animals, particularly troops of wild monkeys. Hippopotami are common in rivers throughout Africa. Domestic animals are few because they are infected by the tsetse fly which transmits sleeping sickness (the animal variety is called nagama). In West Africa an extremely small goat, the size of a dog, can be seen everywhere—especially on the roads and village streets. Birds, the natural inhabitants of the forest, abound in great numbers and varieties. In the Congo basin alone, some 1,200 species have been sighted and catalogued. Common over settled areas are vultures, the scavengers of Africa. The crocodiles are the largest reptiles found in all the rivers and streams throughout the forest areas, and snakes including the dangerous species of vipers and cobras, the puff adder, green mamba, and python are numerous. However, they are seldom seen.

b. Diseases. The evil reputation of tropical Africa as the "white man's grave" is linked to insects. Most parts of Africa are dangerous because of the many diseases which thrive under tropical conditions, and to their carriers—insects, especially the mosquito. The tsetse fly belt covers perhaps one-third of Africa, and causes sleeping sickness (trypanosomiasis) in both man and animal. Found especially on the margins of bush or forest near rivers and lakes, the flies are particularly troublesome during the hotter periods of the day. Thanks to improved drugs, the disease is no longer a menace to human life. The most pernicious insects in Africa are the mosquitoes, carriers of two of the most dreaded diseases—malaria and yellow fever. The *Anopheles gambiae* mosquito is the chief carrier of malaria. The control or elimination of malaria depends upon the destruction of the mosquito by preventing it from breeding. Unfortunately, the *Anopheles gambiae*

breeds very easily and is not particular about where it can deposit its eggs. To the non-African entering a malarial area, the disease strikes with devastating effect. Yellow fever is an infectious disease transmitted from man to man by the mosquito *Aedes aegypti*. Fatalities from the disease for natives are in the range of five percent; survival from an attack provides immunity. Fatalities from the disease among non-natives from yellow fever-free areas (i.e., the United States) may range upward to 40 percent. The carrier mosquito is very widely distributed—covering perhaps one-half of Africa—and breeds freely in anything which will hold water, especially around towns and villages. Fortunately, there is a safe and effective inoculation against yellow fever—an essential requirement for anyone entering the tropics. In Africa the same mosquito transmits "breakbone" (dengue) fever. Though rarely fatal, the victim is immobilized for two or three weeks with high temperatures, a skin eruption, and acute pains of the joints and muscles. New arrivals to the tropics are especially vulnerable to dengue fever. Other major diseases are those carried by water-borne organisms, effects of which range from mildly upset digestion to death. These include dysentery, various forms of diarrhea, and other more serious diseases, all of which are acquired primarily through drinking or using contaminated water. Untreated water can also contaminate cooking utensils or uncooked vegetables. Indirectly responsible for much disease is the climate of the tropics which favors the rapid decomposition of foodstuffs and lowers man's resistance. Few non-Africans who spend time in the tropics are able to escape some form of these problems. The rodent and lice species are another scourge of Africa. In addition to being a constant irritation, rodents and lice are far more important because of the diseases they carry. These include various types of plague and relapsing fever, caused by a blood parasite carried by a louse or tick. Other diseases, not exclusive to the tropics, are a serious problem in Africa. Probably the most frequent cause of death in tropical Africa is tuberculosis. Pneumonia, smallpox, and meningitis are also important. Gonorrhoea and syphilis are very common in many districts. Little has been done to check the spread of syphilis. For additional information on diseases, see paragraph 2-9.

Section V. ORIENTAL JUNGLES

2-21. General

The Oriental jungle is the most widely distributed jungle extending north of the Tropic of Cancer in Assam; south of the Tropic of Capricorn in southeastern Queensland; as far east as the Fiji Islands in the Southern Pacific; and as far west as the Western Ghats of India. The jungle is most extensive in areas of Malaya, Sumatra, Borneo and New Guinea, and also covers substantial areas in East Pakistan, Burma, Thailand, Laos, Cambodia, Vietnam, and the Philippines. Although vast jungle areas have been cleared or modified, the oriental jungle still is recognizable and prevalent over most of its former range. Only in Ceylon, Java, and some of the Pacific Islands, has there been an almost complete alteration of the jungle environment.

2-22. Southeast Asia

a. General. Southeast Asian jungles are important because of the vast area given over to jungle. Deeply penetrated by gulfs and arms of the sea and marked by an intricately rugged terrain, mainland Southeast Asia has been affected by abundant rainfall which has created an elaborate network of rivers and deltas. Mangrove swamps are a prominent characteristic along coastal areas and river mouths. With the exception of the great river valleys—the Irrawaddy, Salween, Menam, Mekong, and Sang-Koi—the relief is mostly upland, interspersed with steep serrated ridges of the Arakan and Annamite chains and the lesser residual ranges of the Malaya interior. Separating these razor-backed ridges are innumerable valleys, many of which are choked with bamboo. These topographical characteristics are prevalent also in Indonesia and the Philippines.

b. Climate. The temperature of practically all Southeast Asia very seldom falls below 64°, and the mean temperature is around 80°. Throughout Southeast Asia, the air is quite damp as the relative humidity is high, exceeding 90 percent at night and rarely dropping below 65 to 75 percent by day. Heavy rainfall is typical in Southeast Asia. During the monsoon season, northern Burma receives an extraordinary 200 inches of rainfall. The monsoonal winds in Vietnam, for example, cause an annual rainfall ranging from 80 to 128 inches. Atmospheric depressions in Southeast Asia are also common, usually stemming from marked differences between sea and air temperatures. Squalls in certain areas are

also frequent. In the Philippines and Vietnam, the main typhoon season lasts from July to November; in Melanesia to the south of New Guinea, from November to April. Moving in from the ocean, clouds often become trapped in mountainous valleys for long periods of time and can restrict air operations.

c. Vegetation. Southeast Asia has a variety of vegetation. The major differences involve the tropical rain forest of both the equatorial lowlands and the humid tropical zone north and south of the equator and the tropical deciduous forests (monsoon forests) areas of seasonal drought. Tropical rain forests in Asia are extremely dense, usually occurring in three layers, with the tallest trees growing to 150 feet. The ground itself is thickly carpeted with a wide range of plants and shrubs. The dense undergrowth is further complicated by liana (thick creepers) and palm rattan, making movement very difficult. Closely spaced bamboo commonly grows between 30 to 40 feet high, and at times reaches the height of 130 feet or more. Prevalent also in virgin jungles is a strong odor emanating from decaying vegetation. Tropical deciduous (monsoon) forests are found at lower altitudes, mainly in southeastern Indonesia and on the mainland north of 7° where the annual rainfall does not exceed 80 inches. The true monsoon forest is bare in winter and the undergrowth is fairly thick; the main trees are more widely spaced and have less foliage than those in the tropical rain forest. Along the coastal estuaries of Southeast Asia are belts of mangrove trees, varying in width from 100 yards to two miles or more. Beyond this area fresh water swamps are frequently found. This kind of terrain covers vast areas of Malaya, eastern Sumatra, and southwest Borneo. The original characteristics of oriental jungles have been altered either by being cleared permanently for cultivation or by being cleared by slash-and-burn cultivation which has created a secondary growth jungle that is not as tall as, though far more tangled than, primary growth. Moreover, once the land is cleared, the reversion to the original jungle may take as long as 100 years. So long as shifting cultivation continues, reversion to the jungle cannot occur, as tribal cultivators rarely leave an area fallow for more than 15 years. Despite the dense vegetation of the secondary growth jungle, most of the soil in Southeast Asia is not fertile. Furthermore, large portions of the highlands in Sumatra, Borneo, New Guinea and

mainland Asia have been so severely eroded by slash-and-burn cultivation that only wasteland scrub will grow, forming tangles as high as 15 feet.

d. Tribes. Occupying the jungle area in South-east Asia are numerous primitive tribes. In Burma, it is believed the tribes account for one-fifth of the population and occupy about one-half of the land. In Laos, they may comprise as much as one-third of the population and occupy 80 percent of the land. In South Vietnam, these primitive tribes are known collectively by the French word *Montagnard* (mountaineers) and account for about 15 percent of the population and more than two-thirds of the land area. Most of the tribes utilize slash-and-burn methods. The monsoon seasons govern their agriculture; planting rice in early spring allows growth during the rainy season and harvesting in the fall. Normally, these tribes move about every seven years in order to find fresh soil. Typical of tribal movements are the Seman of Malaya, who group in bands of 20 to 30 individuals and have certain "territory," consisting of about 20 square miles. In this area they roam, collecting what they can find to eat—berries, nuts, pith, leaves, grubs, and roots. Hunting and fishing are sporadic activities.

e. Animal Life and Diseases. Most of the tropical diseases found in the other jungle areas are also prevalent in Southeast Asia; malaria is the most common. In mountainous areas, such as the northwestern corner of Burma, malaria is particularly virulent. Numerous varieties of snakes are found in Southeast Asia. One of the most venomous in the world is the blue krait in Vietnam. It is bluish-black in color and less than four feet in length. Most active after dusk, the krait is seldom encountered during the day. Likewise, most Asian and King Cobras are rarely seen. One of the most common snakes in Vietnam is the Bamboo. Its venom, however, is relatively weak. For additional information on diseases, see paragraph 2-9.

2-23. Other Oriental Jungle Areas

The tropical and subtropical areas of India lie be-

tween 8° and 26° north and 72° and 84° east. Subtropical climate and rainfall occur in the western peninsula and southwestern parts of India, including the Western Ghats, from Bombay southward. Vegetation includes tropical rain and tropical deciduous forest. Shrubs and wood climbers are abundant (Kanara, Mysore, Coorg, and Kerala regions), rendering large areas almost impenetrable.

2-24. Ceylon

Ceylon lies in the monsoon region of Southeast Asia and has the same humid tropical climate. Measuring 240 by 140 miles, Ceylon has a substantial coastal plain, most extensive on the north side, which surrounds an upland belt. The mountainous central region is the source of small rivers flowing to the coast. Most of the southwest region is agricultural, having been claimed from the jungle. However, in the north and east, slash-and-burn cultivation is still practiced and most of the area is covered with secondary scrub jungle. Tropical rain forest occurs in the south and lowlands, and a tropical thorn forest covers the northwestern and southwestern coastal areas.

2-25. Pacific Area

The Pacific islands beyond Indonesia and the Philippines are a special case which can only be generalized in view of the prevailing variation in physical relief, rainfall, and temperature. Among the islands, all types of terrain are encountered, from barren areas with rocks and sand to areas with dense vegetation.

2-26. Australia

In the Darwin area of the north and down the east coast to Brisbane there is vegetation approaching that of the jungle. In this hot, wet region, tropical diseases have been almost eliminated and the conditions and standards of living are as good as those of the temperate parts of Australia, testimony that Caucasians can remain healthy in the tropics. In this area most snakes are poisonous.

Section VI. MILITARY ASPECTS

2-27. General

a. Military operations in a jungle environment are influenced chiefly by the tropical climate and the forest vegetation which limit movement, observation and fields of fire, communications, con-

trol, battlefield surveillance and target acquisition. These limitations apply, in varying degrees, to all land combat forces and support elements whether they be dismounted, mounted or airmobile. Excellent cover and concealment are availa-

ble in jungle terrain; therefore, it is essential that commanders at all levels employ adequate security measures to prevent surprise and to protect the command in all types of operations.

b. The scarcity of roads, trails, and railroad networks increase combat service support problems and increase engineer support requirements to maintain lines of communications. Commanders must exploit all means of ground, air, and water transportation in the movement of supplies and troops. The tropical climate of the jungle multiplies the maintenance requirements for all weapons and equipment. Daily cleaning and inspection of equipment are mandatory, even for weapons that have not been fired.

c. The tropical climate and difficult, densely vegetated terrain over which operations must be conducted dictate that all equipment accompanying combat forces be rugged, lightweight and man-portable. The fighting load of the soldier should be kept under 40 pounds.

d. Troops operating in a jungle environment are exposed to many health hazards. An increased disease rate will normally result from the sudden entrance into a tropical area of a large number of unacclimatized soldiers who have little or no resistance to many of the endemic diseases. Such conditions will probably exist in the early period in any jungle action. The greatest loss of effectiveness among soldiers will probably be the diarrheal diseases and fungus infection. Continuous protection will be required against mosquitoes, flies, fleas, leeches and other parasites. Experience has shown that more troops were hospitalized during jungle operations because of disease than because of wounds.

e. The jungle is neither impenetrable nor unfriendly. The major effect of the jungle environment on warfare is the restriction imposed on maneuvers and the tempo of operations. The accepted principles of war are fully applicable—only the emphasis varies. All fighting is at short range under conditions of extremely limited visibility. Jungle warfare requires specialized techniques and demands higher standards of training and leadership at lower levels than any other form of fighting.

2-28. Observation

a. Ground observation in jungle areas varies according to the type of vegetation. In the tropical rain forest the canopy, which consists of mature trees, is so thick that it cuts off most sunlight, and ground observation is limited to about

20 or 30 meters. In the tropical deciduous forest, the tangle of secondary growth may limit ground observation to 5 meters or less (fig. 2-14). In tropical savanna, commonly called elephant grass, which sometimes grows to a height of 15 feet or more, ground observation may be limited to a few feet. In mangrove swamps, ground observation will normally be limited to about 20 meters. Observation will be greatly restricted during rainy seasons, not only by the rain itself, but also by the heavy ground fogs which may linger for several hours after sunrise.

b. The tops of ridges and hills offer slightly improved observation because these features usually contain sparser jungle vegetation than is found in the valleys.

c. Aerial observation is generally ineffective because observers cannot see the activity underneath the jungle canopy and observation is extremely difficult during the rainy season due to excessive downfall and low hanging clouds plus fog and haze. This activity may include movement of substantial bodies of troops over fairly long distances.

2-29. Fields of Fire

a. Except along trails and roads, fields of fire are poor in jungle areas containing dense vegetation. Because fields of fire (including grazing fire for automatic weapons) are limited to 5 to 30 meters, lanes must be cleared. In order to avoid revealing weapons positions, a fire lane in dense vegetation usually is in the form of a tunnel from 1 to 3.5 meters wide with the overhanging foliage left intact. Because of the limited observation and the reduced fields of fire, short range, quick burst, quick response weapons are the most useful.

b. The thick canopy of the tropical rain forest and the tropical deciduous forest will absorb the fragments of most antipersonnel rounds, thereby reducing the effective bursting radius of artillery and mortar rounds. In making adjustments, forward observers should be proficient in adjusting by sound since observation and visibility may be limited to a few meters. When opposing forces are in close contact, the difficulty of accurately locating and marking targets restricts the effective employment of supporting artillery and air strikes directly onto the enemy positions.

2-30. Concealment

Jungle areas provide excellent concealment from air and ground observation. By employing proper



Figure 2-15. Limited horizontal visibility.

camouflage techniques, concealment of troops and equipment from air and ground observation and from most types of surveillance devices is possible in all types of jungle vegetation except the very young secondary growth group. Seasonal changes of coloration must be studied. Stringent discipline must be maintained when making movements and when occupying positions to insure against unnecessary clearing of overhead concealment. It must be remembered, however, that the concealment provided by vegetation in no way protects the soldier from enemy fire. It is easy for troops to mistake concealment for cover.

2-31. Cover

Except in tropical rainforest, the trees in most jungle areas will not provide extensive cover. Average tree trunks are generally not more than 12

inches in diameter; in areas where large trunked trees are located the trees are usually widely spaced. Because of the high annual rainfall and the resultant erosion, excellent cover in jungle areas is provided by surface irregularities, such as ravines, gullies and large rocks. In certain jungle areas, high water tables require that artificial cover be constructed above ground level.

2-32. Obstacles

The jungle itself is an obstacle. Major obstacles to movement include: dense vegetation; deep, eroded gullies; steep hills and cliffs; wide and deep rivers; and numerous fast flowing unfordable streams which can become raging torrents during the rainy season. During the rainy season, swamps may become impassable to even foot movement because of the depth of the water. Manmade ob-

stacles can be used to easily improve natural obstacle condition presented by the jungle.

2-33. Key Terrain Features

Key terrain features in jungle areas include roads, trails, navigable rivers, high ground, and communication centers and any other features that expedite movement, resupply and evacuation. Clearings in which a helicopter can land may be tactically a key terrain feature in any operation.

2-34. Avenues of Approach

a. Cross-country movement in jungle areas is slow and difficult. Troops may have to cut their way through continuous thick undergrowth or make detours of impassable swamps. On most trails troops must move in column and the rate of movement rarely exceeds 1.5 kilometers per hour. Ridge lines are the most favorable routes and preferable to valley travel which involves the crossing of numerous streams and gullies. On ridge lines, trees are more widely spaced, buttressed roots less common, and the better drainage results in less muddy surfaces. In addition, animal trails and native trails are often found on the ridges. Movement on ridges is usually easier, faster, and less tiring for troops. Movement is possible along small, fast flowing streams with traversable beds. Movement is poorest along the

banks of rivers, because of the dense vegetation, mud, swamps, and tributary streams normally located in the vicinity of rivers. It is easier to follow corridors than it is to cross them. In flat jungle areas taking a direct route from one point to another may be convenient; however, in hilly jungle areas, such a route may prove to be the most demanding on the physical condition of troops.

b. Wheeled vehicles are restricted to roads and trails. Cross-country movement by these vehicles is normally infeasible unless extensive engineer support is provided. The most suitable routes for tracked vehicles are roads, trails, beaches, grass or bush-covered fields and stream valleys; however, tracked vehicles can move through difficult terrain and at times will be able to pass through rain forest and secondary growth forest. There are few bridges in jungle areas and most of these are not capable of supporting military vehicles heavier than a 1/4-ton truck. Because of the lack of lateral connections between existing roads or trails, communications and mutual support between units moving on separate axes is an additional problem which must be considered.

c. Selection of avenues of approach must be based on a detailed reconnaissance of the area of operation. In selecting avenues of approach available to the enemy, the intelligence officer should consider no portion of the jungle as impassable, no matter how difficult or thick.

Section VII. MOVEMENT AND DISTANCE

2-35. General

Movement in the jungle is calculated in terms of time rather than distance. In the early stages of a jungle operation, road nets may be limited or non-existent and cross-country movement is slow and difficult. The rate of movement will depend on:

- a. Distance to be traveled.
- b. Availability of road and trails.
- c. Soil type and condition.
- d. Density and type of vegetation and type of terrain (e.g., mountainous, flat, inundated).
- e. Number of obstacles to be traversed.
- f. The formation and security elements to be employed.
- g. Physical condition of troops.

2-36. Time-Distance Factor

The following data are offered for planning purposes only. Accurate estimates of movement times

and capability must be determined by commanders through experience and a detailed study of the area of operations.

a. *Foot Movements.* The terrain and prevailing high temperature and humidity limit the rate of foot movement. Soldiers tend to tire much faster and heat exhaustion is a common occurrence. Water consumption is high, creating the necessity for each man to carry two canteens. When the tactical situation permits, tracked vehicles can be used in some areas to break trail for foot troops.

(1) *Tropical rainforests.* Average rate of movement is about 1,000 meters per hour, dependent upon the incidence of hills, rivers, and swamps which will slow movement considerably.

(2) *Tropical deciduous forests.* Average rate is about 500 meters per hour.

(3) *Swamps.* Average rate is about 100 to 500 meters per hour. During the rainy season some swamps become impassable because of the

depth of the water, therefore requiring the use of boats, rafts, and amphibious vehicles.

(4) *Tropical savanna* (Commonly called *elephant grass*). Rate of movement is about the same as for tropical deciduous forest, but is more taxing and exhausting.

(5) *Bamboo*. Extremely slow, dependent upon the size. Bamboo grows in impenetrable clumps which can normally be bypassed.

(6) *Rice paddies*. During the dry season, the rate of movement is the same as for open terrain. During the rainy season, the average rate is about 1,000 meters per hour.

(7) *Road and trails*. Average rate of movement is 3 kilometers per hour on roads and 1.5 kilometers per hour on trails.

b. Vehicle Movement.

(1) The primary factors that affect the movement capability of wheeled and tracked vehicles are:

- (a) Availability of roads and trails.
- (b) Soil condition.
- (c) Density and type of vegetation.
- (d) Slopes of hills and mountains.
- (e) River, stream, and swamp obstacles to be crossed.
- (f) Weather conditions (dry or rainy)
- (g) Effects of high and low tides on rivers, streams and inundated areas.

(2) Although any one of the above factors may affect vehicle movement, a combination of factors, such as weather and soil, slope and vegetation, will normally have to be considered when determining the affect on movement.

(3) Wheeled vehicles are essentially restricted to roads and trails throughout jungle areas. While much of the ground becomes firm enough to support wheeled vehicles during the dry season, numerous obstacles such as rice paddy dikes, dense vegetation, steep slopes, ditches and canals, and swamps make cross-country movement impractical without extensive engineer support. In the dry season the average rate of movement on roads and trails is 25 to 40 and 8 to 16 kilometers-per-hour, respectively. During the rainy season movement becomes difficult because of vegetation adjacent to the road or trail, deep ruts, soft soils and flooding.

(4) Tanks and APC's. In some jungle areas it is impractical to expend the engineer effort necessary to move armored units; in other areas armor can move with ease. Between these extremes, conditions will vary widely in different parts of the area of operations and at different times of the year. Some general guidelines are:

(a) Soils composed of red clay silt (common in jungle areas) tend to break down when wet. Single tracks may usually be made but repeated passes or sharp turns cause these soils to break down and become untrafficable. Such soil conditions often exist in plantation areas where tracking is not advisable during the rainy season. A simple test for this type of soil is to stick a rod (such as from an ammunition box) into the ground where surface water is standing. If the water drains through the hole, clay is usually present and tracking is not advisable during the rainy season. For detailed discussion on soil conditions and trafficability, see TM 5-530 and FM 30-10.

(b) Inundated areas containing yellowish reeds and cloudy water can be expected to have a soft bottom.

(c) In the dry season, rice fields are generally trafficable for APC's and tanks; however, some rice fields adjacent to rivers are not trafficable for the tanks. During the rainy season, rice fields are normally untrafficable for medium tanks and those fields without standing water are too soft to support the APC, whereas those rice fields containing clear water and green vegetation are usually trafficable for the APC. Watch the water buffalo and similar animals. They do not go where they cannot stand on the bottom. If the bottom supports them, it will usually support the APC.

(d) Bridging requirements must be considered for all tank and APC movements. Tanks normally require bridging assistance to cross rivers, canals and streams. The soft soil bottoms of rivers and some streams generally do not have sufficient bearing strength to support medium tanks. The bridges found along roads are frequently less than class 20. Since the APC can swim, it will normally not require bridging assistance in crossing rivers; however, field expedients may have to be used in negotiating the steep, soft-soil banks. During the rainy season, the water velocities of streams and rivers may exceed the swimming speed of amphibious vehicles.

(e) The capability of tracked vehicles to penetrate jungle vegetation is dependent on soil condition, slope, and vegetation density. Trees with trunk diameters of 15 to 20 centimeters (6 to 8 inches) are considered to be the practical upper limit of trees which can be toppled by medium tanks. On slopes of 20 percent and greater, trees 10 centimeters in diameter will slow and may stop tanks. Closely spaced trees usually are

relatively small in diameter. When pushed over by a tracked vehicle, they may create a mass of vegetation sufficient to stop the vehicle. Large diameter trees usually grow 10 to 20 feet apart, thereby making it possible to pick a path through the vegetation. The soft soil conditions, especially during the rainy season, must be considered when determining movement capability of tracked vehicles in jungle areas. The use of a field expedient cutting bar across the front of tanks can effectively assist in clearing brush and trees.

c. Cross-Country Movement. Maintaining direction during cross-country movement in jungle areas is extremely difficult. Unit commanders at all levels must be proficient in land navigation. Aircraft (especially the helicopter) can be effectively used to assist in determining position, in

providing direction and in selecting routes through areas of dense vegetation.

2-37. Engineer Support

A primary task of engineer units participating in jungle operations is the construction of roads and trails and the construction of bridges over gaps for the movement of the wheeled and tracked vehicles of the tactical force. Normally, every road or trail to be used by the force is newly constructed. The force engineer, based on available ground, map or aerial reconnaissance, submits comprehensive plans detailing the type engineer units to be employed and the additional engineer equipment and material required. For further details see paragraphs 3-13 through 3-23 and FM 5-1.



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CHAPTER 3

COMBAT AND COMBAT SUPPORT

Section I. INFANTRY

3-1. General

a. Infantry, because of its versatility, mobility and capability to conduct operations in all types of terrain and climate, will play the dominant role in jungle operations. Other combat and combat support units are used primarily to support the advance of infantry elements. The fundamentals of employment and conduct of tactical operations for combat units as contained in the 7-series field manuals and FM 61-100 are applicable, with modifications to meet the conditions of the jungle environment.

b. To obtain the full value of concentrated firepower from supporting weapons, commanders must determine how and to what extent they can overcome the limitations of the jungle on the mobility, visibility, and control of the infantry's organic supporting weapons. Good firing positions for direct fire and indirect fire weapons are comparatively hard to find in dense jungle terrain. The frequency of close combat generally requires additional automatic fire, canister, fragmentation and concussion ammunition.

c. In jungle fighting, every sound or movement to the front is not made by the enemy. It could be a small friendly unit that has strayed from its assigned zone into the adjacent unit's line of fire. All units must include in their standing operating procedure the circumstances under which individual and crew-served weapons will fire on targets that are not definitely identified. The SOP should establish methods of maintaining lateral contact and must prescribe specific procedures for obtaining the current location of adjacent units.

d. The enemy may send out small probing units to invite fire, in an effort to locate weapon positions. Therefore, the commander must insure fire discipline at night, and prescribe the conditions under which each type weapon will open fire. These conditions must be understood and adhered to by weapon crews and the leaders of supported units.

e. Unattended ground sensors can be profitably employed in jungle operations such as attack, defense, riverine, security, and airmobile. The sensor system can develop accurate and timely information at the echelon where maneuver forces or firepower can take full advantage of the information. In planning operations, the employment of sensor devices should be included in the overall information collection plan. The success of sensor devices will depend to a degree upon the ability of the employing force to deliver timely and effective fires upon the area in which a threat is detected. The methods of employing the fire support, in conjunction with sensors, are limited only by the commander's ingenuity; however, detailed planning and close coordination between the commander and fire support elements is essential. It should be noted that the information produced by sensors is of no tactical value unless it can be received, interpreted and acted upon in a timely manner with appropriate firepower or maneuver forces or both. Sensors must be monitored by devices, either manual or automatic, and information interpreted and transmitted to the operational unit which must respond to its intelligence. Doctrinal concepts for the employment of these devices are being developed and will be incorporated in FM 7-20 and other appropriate manuals.

3-2. Mortars

a. Independent Operations by Small Units.

(1) Mortars may be effectively employed by the infantry rifle company if properly tailored to suit the mission and if personnel are thoroughly proficient in crew drill. Any small clearing in the jungle canopy can provide a mortar with the overhead clearance necessary to support the rifle company with close-in fires. For quick support purposes a mortar crew need carry only the tube, bipod, inner ring of the base plate, and the sight. The basic load per tube for operations of

24 hours or more will vary with the specific situation and will be prescribed by the commander. Thirty rounds for single tube or 20 rounds per tube for two or more tubes is a valid planning figure. To fire the weapon, use the sight for finding elevation and the LENSATIC compass for determining deflection. At close ranges the error factor when using the LENSATIC compass will be minimal. With the mortar, the infantry rifle company can furnish its own quick and effective supporting fires in numerous instances where speed is of the essence and higher echelon fire support is infeasible due to inability to quickly pinpoint the friendly unit's location in the jungle. Forward observers must be proficient in adjusting fires by sound since observation is close to nil. In heavy jungle areas mortars, are often limited in their use when accompanying moving forces, and it is generally better to preposition them with the base of fire. Mortars are effectively used to provide fires in the defense.

(2) Mortars are effective if they are carried on vehicles as antimotor transport ambush weapons as they can be employed either in vehicles or from the ground after dismounting. Fire can be brought on ambush positions, then lifted on assault and shifted to block escape of ambush elements.

b. Employment of Mortars at Battalion Level.

(1) Often 81mm mortar elements from rifle companies may be placed under battalion control.

(2) Commanders must anticipate displacements well in advance and plan to prepare positions as far in advance as possible. The time factor for the preparation of emplacement, entry roads and mask clearance is greatly increased, sometimes requiring up to 24 hours.

(3) The selection of good firing positions is difficult. Positions will be small because they must be cut out of the jungle. Advance parties must be increased in size and supplied with additional axes, machetes and engineer tools.

(4) In preparing mortar emplacements as outlined in FM 23-92, the following modifications must be made:

(a) Dirt must be placed between the layers of logs to decrease bouncing.

(b) Base plates must be pegged at the rear to prevent sliding.

(5) To minimize the probability of aerial detection, the cutting of mask clearance must be kept to a minimum. Small trees should be bent and anchored to preclude the permanent loss of overhead canopy. Branches of fallen trees must

be used as camouflage to replace the cut canopy, and fresh cut stumps must be blackened.

(6) The thick undergrowth forces the survey team to measure short increments of a given line at a time with resulting loss in accuracy.

(7) 81mm mortar personnel must be physically conditioned to displace without vehicular transportation. Unit SOP must charge subordinate elements with the responsibility of hand carrying ammunition for the mortars to predesignated points. Units must often increase the size of mortar squads and provide additional ammunition teams, or share the ammunition load with the rifle elements to facilitate displacement on foot.

(8) The limitation imposed on observation and visibility requires an increased number of observers and all leaders must have a working knowledge of observed fire procedures and means of communicating fire requests and adjustments.

(9) Observers must receive training in adjusting fire by using the creeping method of adjustment. Observed fire on the ground will be extremely difficult due to the vegetation which limits observation and visibility to short distances. The observers must operate well forward to be able to observe adequately.

3-3. 106mm Recoilless Rifle

a. Employment of the 106mm recoilless rifle will usually be restricted to roads and under battalion control. When employed, it is assigned its primary mission of antitank protection with a secondary mission of providing fire support.

b. When firing BEEHIVE ammunition, the 106mm recoilless rifle is extremely effective as an antipersonnel weapon in the defense or convoy escort in a counterambush role. The 50 cal. spotting rifle can be effectively used against snipers or other long range point targets.

3-4. 90mm Recoilless Rifle

a. Because of its accuracy, portability and striking power, the 90mm recoilless rifle, organic to infantry units, is a valuable supporting weapon in jungle operations. It is especially useful in reducing pillboxes and bunkers frequently encountered in jungle operations. Care must be taken to select positions that afford safety from, and prevent disclosure by the backblast.

b. For extended dismounted operations when bunkered enemy positions are not likely to be encountered, the commander may decide that this

firepower is not required and leave them with the combat or field trains. Weight of the recoilless rifle and the ammunition in this situation is a significant factor.

3-5. Individual Light Antitank Weapons

Individual lightweight antitank weapons (such as the LAW-M72, which is issued as an item of ammunition and is discarded after use) are ideally suited for jungle operations. Their small size and light weight make them easily transportable through the jungle even on extended dismounted operations. In a secondary role, they can be used to assist in reducing pillboxes and bunkers frequently encountered in jungle operations.

3-6. Mines and Boobytraps

The jungle lends itself to the use of mines and booby traps. The characteristics of the jungle cause their emplacement to be comparatively easy and detection to be extremely difficult. When authorized by appropriate commander, mines and booby traps can be used to advantage along trails, roads, ridge lines, streams, and in conjunction with other defensive measures. Recording and reporting is extremely important and is accomplished as outlined in appropriate publications (FM 5-31, FM 5-34, FM 20-32). Because mines have a tendency to shift during heavy rains, they must be securely implaced.

3-7. Small Arms

a. U.S. Rifle, 7.62mm. The 7.62 cartridge gives excellent penetration and accuracy; the bullet sometimes sheds its jacket when passing through thick trees or large roots and the lead case continues on to deliver good destructive effect. This characteristic lessens the effectiveness of cover made available to the enemy by the vegetation. Care must be exercised to prevent dropping magazines on the jungle floor where they may be easily lost.

b. U.S. Rifle, 5.6mm. This extremely light and compact weapon is ideally suited to jungle combat. Its short length and the light weight of the ammunition it fires make the weapon easy to employ rapidly. The cartridge is a high velocity round with good ballistic characteristics; the bullet tends to tumble when deflected, giving good wound effect. The short length makes it easy to use by men of small stature. Precautions with magazines apply as with the 7.62mm rifle. The light weight of the ammunition increases the

number of rounds a soldier can carry and the rapid rate of fire provides increased firepower to units engaged in close-in fighting.

c. Machinegun, 7.62mm. This weapon is an ideal automatic arm for jungle combat. Its compact design, light weight and excellent sights enable it to be fired from the standing, sitting or squatting positions and effective hip fire can be delivered if a sling support is used. Ball and tracer linked ammunition (1 tracer to 4 ball) should be used and the gun fired in bursts of 5 to 6 rounds; fire can then be observed in subdued light along the line of tracer fire. The bipod should be folded except when the opportunity to fire from the prone position exists.

d. 40mm Grenade Launcher. This weapon, although shoulder fired, is a large bore weapon and it is extremely effective for jungle fighting. It is compact, light, and can be fired using the same positions as the service rifle. It can be used for reduction of point targets, against groups of enemy soldiers and for fire into the killing zones of ambushes. Great care must be taken to prevent its fires from being masked by tree limbs. Although the individual round is light, careful selection of targets is necessary, to reduce resupply problems. Dense vegetation will reduce its normal effective bursting radius. When using the 40mm multishot antipersonnel round, the weapon is highly effective against grouped personnel out to a range of 35 to 50 meters. It is ideal as a counterambush weapon, and is often employed with the point during movement.

e. Grenades. Grenades must be used carefully in the jungle. The limitation on distance they can be thrown and difficulty of observation may result in casualties by using troops. They are most effective when used against hastily prepared positions, groups of enemy personnel, in prepared defensive positions, and against dug-in positions in the offense. CS grenades can be effectively used against a dug-in enemy, or to counter an ambush. Smoke grenades are a necessity to mark the location of friendly elements for aerial observers. One or two smoke grenades are normally carried by each individual. Care must be taken in using them since the smoke may hang below the canopy in heavy jungle, and may rise above the canopy at a considerable distance from where it was thrown.

f. Bayonet. This weapon is often cumbersome for use in jungles. It is effective in open areas and is ideal for hand-to-hand fighting during counterattacks from a defensive position in which the

vegetation has been shot or burned away. It should be affixed to the rifle only on order of the squad or platoon leader.

g. Shotgun. The shotgun has proven to be an effective weapon for close-in fighting, which dominates jungle combat. It is effective for use in ambushes and by the forward elements of a patrol. The shotgun weighs, in the roit/combat version, about 6.5 pounds and is shorter than the service rifle. This short length makes it easier to use in dense jungle. The simple and rugged mechanism, constituted of only seven major parts or parts groups, simplifies maintenance and repair and reduces the chance of malfunction in a tropical environment. An outstanding attribute inherent in

the shotgun is its flexibility, because the ammunition is available in various loads. The user can exercise a choice in selection of a load to suit the nature of the target.

h. Obsolete Military Arms. Because of the availability of military arms on the open market, especially of bolt action rifles, it will be found that guerrilla forces will often be armed with these weapons. Every jungle soldier should be trained in the use of enemy weapons; however, these weapons should be used only in emergencies as the characteristic sound of both friendly and enemy weapons is often a valuable intelligence source used to identify firing units.

Section II. ARMOR

3-8. Basic Considerations

a. General.

(1) The fundamentals of employment and conduct of tactical operations for armor units as contained in the basic armored field manuals are applicable, with modifications, to meet the conditions of the jungle environment. The factors of METT (Mission, Enemy, Troops available and Terrain) remain the principal considerations for determining how and when to employ armor in jungle operations. Emphasis is placed on the factors of terrain and the enemy's antitank capability. Although the general nature of the terrain does not favor tank employment on a large scale, armor as part of a combined arms force or team can be effectively employed in the jungle. By bold and imaginative employment, surprise and psychological advantage may be gained by the sudden appearance of armor in an unexpected area or from an unexpected direction rather than through speed of movement.

(2) In many areas movement of armor units may be limited to roads, trails, beaches, or secondary growth areas; however, armor vehicles can move through difficult terrain and at times they will be able to pass through primary rain forest. Visibility restrictions in dense vegetational areas coupled with an enemy antitank capability will require that dismounted troops precede armored vehicles. When the enemy has a limited antitank capability, armored vehicles can lead attacks through the jungle whenever possible, breaking trails, destroying antipersonnel mines and disrupting enemy defenses. A careful ground reconnaissance is a must prior to employ-

ing armor in this manner. When the terrain cannot accommodate cross-country movement, armor may be used along existing roads and trails. In addition to their primary mission of closing with the enemy by direct assault or as part of a combined arms team, armor units are well suited for conducting route security missions in the jungle as well as providing convoy escort.

(3) Armored cavalry units may have to be reorganized to adapt to the local jungle environment. Vehicle and personnel changes may be required. While armored cavalry units will be employed in their traditional roles of reconnaissance, security and economy of force, they may be employed in missions that are usually assigned to armor and infantry combat maneuver battalions. Care should be taken to avoid piecemeal partitionment of armored cavalry units, troops and platoons in particular, to accomplish separate tasks. This practice reduces the overall capability of armored cavalry units and, except when fully justified, reduces the total efficiency of armored cavalry units.

(4) Air cavalry units effectively extend the ground commander's influence in the jungle area of operations. Highly mobile, with superior communications and substantial firepower, these units are readily adaptable to the cavalry mission in the jungle environment.

b. Special considerations. Special armor considerations applicable to jungle operations are:

- (1) Increased emphasis on maintenance.
- (2) A greater requirement for Class V supplies.
- (3) Lack of suitable ground lines of com-

munication place greater reliance on aircraft for resupply.

(4) Rarely are fields of fire adequate for employment of the tank's main armament in its conventional long range capacity.

(5) Visibility restrictions place increased emphasis on command and control of armor units when traversing jungle terrain.

(6) Knowledge of terrain in the area of operation is of vital importance.

(7) Presence of many waterways with soft bottoms coupled with lack of adequate bridges increase bridging support requirements.

(8) Knowledge of specialized techniques to traverse jungle terrain.

(9) Armor units will normally operate with infantry heavy teams or task forces.

(10) Trafficability limitations may restrict the use of tanks to support by fire.

(11) A greater requirement for Class III because of a slower rate of movement.

(12) Ammunition basic loads require adjustment to include more antipersonnel rounds.

(13) Weather, certain terrain, hostile air, air defense, and strength and composition of opposing forces when employing air cavalry units.

3-9. Organization for Combat

In jungle combat operations armored units are normally employed as part of a combined arms force or team. Since jungle terrain reduces the ground mobility of vehicles, tank units will normally operate with infantry heavy teams or task forces. Other elements such as artillery, engineers, and signal are included as required. The organization for combat must be based on a thorough analysis of the factors of METT. The requirements for combat support and combat service support elements will depend on the type terrain and vegetation, obstacles and waterways prevalent in the areas of operations. Engineer bridging support requirements will normally be greatest in lowland jungle areas because of the many unbridged waterways found in this type of area. The organization of armor units may require augmentation with additional or special equipment such as dozer tanks, armored vehicle launched bridges, and movement expedients.

3-10. Combat Formations

Although conventional formations should be used whenever possible, terrain restrictions in the jungle may require the use of other formations in order to maintain control and to employ the fire-

power of armor. Tanks proceeding through dense jungle may have a limited capability of traversing their turrets due to interference by tree trunks. Two formations to enhance the ability of tank units to fire in directions other than to the front are the inverted wedge (see fig. 3-1) and the inverted echelon (see fig. 3-2). These two for-

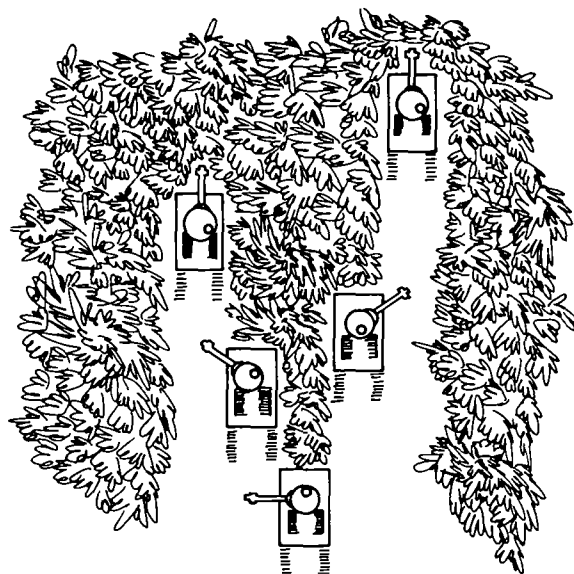


Figure 3-1. Inverted wedge formation.

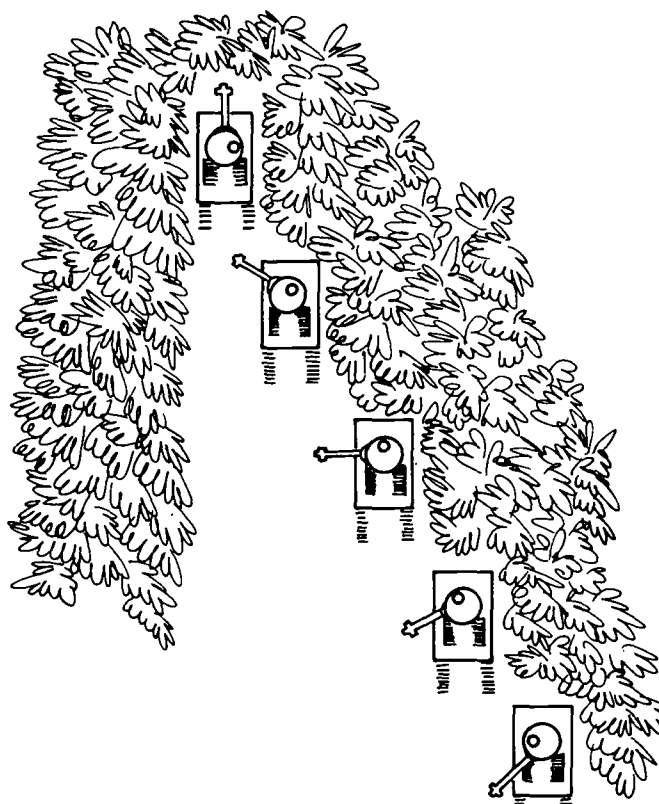


Figure 3-2. Inverted echelon formation.

mations allow for all tanks except the lead tanks to traverse and fire at one flank and to the rear. The inverted wedge formation is also suited for opening trails and clearing jungle roads (see fig. 3-3).

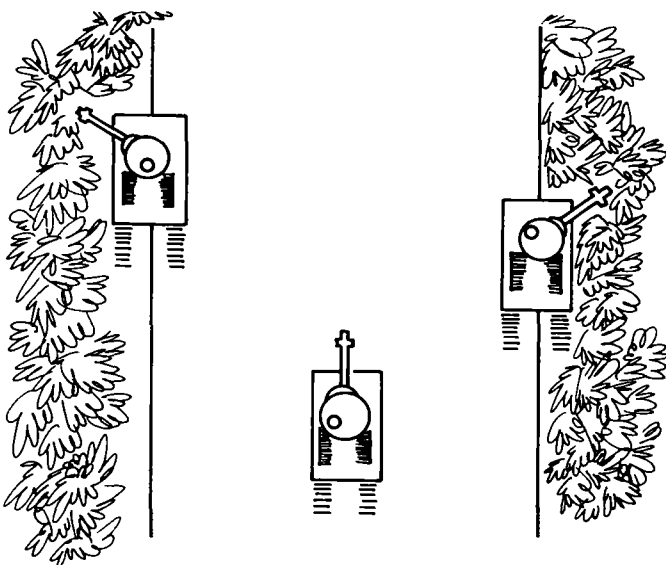


Figure 3-3. Clearing jungle road using inverted wedge formation.

3-11. Prior Reconnaissance

The restrictions to armored mobility in the jungle can be significantly reduced by careful selection of routes based on accurate information. Movements, especially cross-country, should not be based on map information alone. Heavy rains can cause jungle rivers to alter their course and create steep-sided gullies. Strong winds can cause windfalls which result in a tangled mass of impenetrable vegetation. Map reconnaissance must be supplemented with extensive ground reconnaissance and air reconnaissance where possible. During each operation detailed records should be kept of pertinent terrain information. Recorded information can reduce the need for future aerial or ground reconnaissance with its risk of disclosing the planned operation.

3-12. Operations

a. General. The value of tank support in jungle operations lies in the accuracy and amount of firepower that can be produced even at single tank

level. Although the terrain does not favor tank employment on a large scale, in amphibious operations against the coast-lines of jungle areas, tanks may play an important role. Precision shooting by tanks at pin point targets such as bunkers or buildings is often the most valuable fire support available to infantry in jungle fighting.

b. Tasks of Tanks. Tanks provide not only material but also moral support. When operating with infantry, their tasks are:

- (1) Destruction of weapons, troops, positions and enemy armor which would impede the advance or hold up the assault of the infantry.
- (2) Accompany infantry to the objective. If this is not possible because of the terrain, tanks support the infantry by fire if possible.
- (3) Dominate the objective and destroy enemy armor, when applicable.
- (4) In the defense, destroy enemy forces penetrating the defensive position.

c. Tasks of Infantry.

- (1) Sieze and hold the objective.
- (2) Destroy enemy short range antitank weapons.
- (3) Destroy enemy weapons positions which the assaulting tanks may have only temporarily silenced.
- (4) Protect tanks from attacks by enemy infantry.

d. Combined arms operations.

(1) Combat in jungle areas requires a high standard of combined arms training if operations by tanks and infantry are to be effective. Actions will be fought at close range and speed is, therefore, essential. Without precision in teamwork, tanks and infantry will suffer needless casualties. Infantry must appreciate the accuracy of the tank gun in order to work close to the tank gun fire or the target. This requires practice and rehearsals with tanks that will support a particular operation.

(2) When operating in the jungle, the tank is vulnerable to close range antitank weapons. The degree and nature of infantry protection required for tanks must be separately determined for each changing situation. Often protection for tanks will be afforded by the proximity of the infantry within whose formations or dispositions the tanks will be moving or operating. The size of infantry protection provided and the tactics adopted are determined by the task force or team commander.

e. Offense.

- (1) The fundamentals of employment and

considerations of the offense for armor forces apply to offensive combat in jungles. Roads, trails, and rivers are key terrain in jungle operations. Use of mechanized flamethrowers and the increased use of the cannister round should be considered since jungle conditions often require a variety of munitions.

(2) Jungle combat is essentially a fight by small dismounted infantry units operating extremely close to the enemy. A tank platoon may be attached to an assault rifle company to reduce enemy automatic weapons and positions by close-range fires. In close terrain, dismounted troops and tanks move together at the same rate of speed. On trails, dismounted troops generally precede the tanks at about 25 to 50 meters, depending on the terrain and enemy resistance. At times the terrain may restrict deployment to the vicinity of the trail and may limit operations to a one-tank front. Tanks must be protected by dismounted patrols that reconnoiter for routes of advance, antitank guns, and antitank obstacles. Riflemen are designated to protect the flanks and rear of each tank. When the tanks are engaged, riflemen use the tanks as a shield while determining location of the enemy firing positions. When the enemy is located, the tank-infantry team attacks and destroys him. At times, close terrain makes it necessary for a tank commander to expose himself from the turret to locate and maintain contact with nearby tanks.

(3) Sometimes the terrain makes it impossi-

ble for tanks to take part in the assault. In this case, the tanks may support the attack with overhead and flanking fire.

f. Defense in jungles.

(1) In light jungles, the principles of defense in woods generally apply. Thorough and continuous ground reconnaissance is necessary because the observation of security elements is restricted and air reconnaissance is often ineffective. Long range fires can seldom be employed. Armor can effectively clear limited fields of fire by driving around a defensive position.

(2) In a dense jungle, troops are dispersed along the forward edge of the battle area with minimum intervals between foxholes and no gaps between units. Security elements consist of small groups, dug in for all-round defense, to cover trails and other approaches to the position. Security should be out to a distance that will insure detection of the enemy before he is within range to employ his handheld antitank weapons. Frequently, units are isolated in this type of terrain. In this event, the need for all-round defense takes on added significance. Every effort should be made to establish a perimeter as soon after halting as possible. Particular care must be taken to guard against enemy infiltration and dismounted infantry attacks.

(3) Limited passive air defense is possible for armor units in jungle operations, thereby reducing the number of air defense units required.

Section III. ARTILLERY

3-13. General

a. Artillery Principles. The tactical and technical principles set forth by FM 6-20-1 and FM 6-20-2 are applicable to artillery employment in jungle operations.

b. Flexibility of Artillery Favors Employment in Jungle.

(1) Use of artillery fire is not restricted by bad weather.

(2) Artillery can fire effectively day or night.

(3) Artillery can achieve surprise as fire can be brought down upon a target without warning.

(4) Artillery is capable of sustained effort.

(5) Artillery can conduct direct fire against enemy forces.

(6) Helicopters greatly increase artillery mobility and improve ammunition resupply.

(7) Aerial rocket artillery can deliver re-

sponsive aerial fire support in areas not covered by conventional ground artillery.

(8) Artillery can become waterborne in support of riverine operations.

c. Limitations Imposed by Jungle on Employment of Artillery.

(1) Observation from the ground is very restricted, and augmentation by air observation is normally necessary. Both methods will be hampered by dense vegetation and tree canopy.

(2) Because of the problems of observation, it is difficult to compare results of predicted fire with observed fire. Even predicted fire may be less accurate than normal because of inaccurate maps and scarcity of current meteorological data. Heavy vegetation may cause the rounds to detonate high in the canopy, thus reducing the effect on enemy personnel at ground level. Delayed fuzing will often be required to minimize this effect.

(3) Limitations on observation necessitate the use of increased safety factors and distances when delivering fire close to friendly troops. The maneuver commander must assume a greater than normal risk of injury to the risk of providing friendly troops when close in artillery support of engaged units is necessary. The degree of risk assumed must be based on the tactical situation.

3-14. Techniques of Artillery Fire Support

a. General. Enemy troops in thick jungle can be driven out of their areas by artillery fire and forced into friendly ambush and blocking positions.

b. Harassing Fire. Artillery can be used to keep the enemy on the move if the general location of the enemy is known or to harass them by methodically searching an area. This fire must be carefully planned and controlled to avoid excessive expenditure of ammunition.

c. Destruction Fire. This is especially useful in attacking known enemy strongpoints. However, use of this type of fire is limited by the requirement that the target be visible to the observer.

d. Interdiction of Enemy Routes. Canalization of enemy forces into ground of the attackers' choosing is possible with artillery fire. Additionally, probable enemy routes can be blocked as the attack force assaults an enemy force.

e. Deception. Artillery fire in an area away from that in which friendly troops are operating may deceive the enemy. Artillery fire can cover noise of movement of friendly forces so that they may be able to approach within assaulting distance of the enemy without being detected.

f. Searchlights. Searchlights can be used effectively in support of offensive and defensive operations and to provide datum points for aircraft and rallying points for assembly of personnel. See FM 31-36 (Test).

3-15. Coordination With the Infantry

See FM 6-20-1, FM 6-20-2, and 7-series field manuals.

3-16. Positions

a. Battery positions, fields of fire, and clearings may have to be cut out of the jungle and are, therefore, small and compact. This work is expedited by employing supporting engineers with portable power cutting tools and demolitions. Logs from clearing should be used to construct

gun emplacements and personnel shelters. The swampy condition of the terrain may make it impossible to dig adequate gun emplacements. Therefore, mobile gun platforms must be used or wooden pads constructed (see FM 5-15) to provide suitable firing positions.

b. Because the jungle affords excellent concealment for enemy offensive operations, all artillery positions must provide security against enemy infiltration. To insure protection for the positions, security measures include perimeter defense warning devices, all-around (6,400 mil) fire capability and patrols to maintain liaison with other installations. Normally, infantry units will be provided to assist in the defense of forward artillery positions in jungle terrain. To facilitate security, fire support and logistical installations may be grouped in general proximity to each other. Within the position, paths or trenches should be cut to connect each howitzer section with other battery installations and foxholes which can be occupied to support the perimeter defense. Security for artillery positions should include adequate air defense measures. The batteries of a battalion size cannon unit should be close enough to each other for mutual support. When the tactical situation permits, direct support artillery should be located within the reserve to take advantage of the protection it provides.

c. In coastal areas, firing positions may be found on the beaches, around plantations, or on nearby islands.

3-17. Observation

a. Forward observer teams are handicapped by restricted visibility and the unavailability of suitable observation posts.

(1) Forward observers must constantly remain in close contact with the supported unit and well forward.

(2) Forward observers should, where the jungle terrain permits, coordinate with the aerial observer to verify the location of friendly troops, and to obtain positive spotting of rounds.

(3) In making adjustments, forward observers should be proficient in adjusting by sound because observation and visibility may be limited to a few yards.

b. Air observation is restricted over jungle terrain, but may be used to good advantage to:

(1) Observe for enemy activities such as movement over water or cleared areas on land.

(2) Give the general location of enemy installations.

(3) Locate enemy artillery or mortar positions.

(4) Observe and adjust artillery fires.

c. The employment of target acquisition devices is generally restricted by tree canopy, slow survey, poor trails for moving heavy equipment and necessity for clearing fields of operation for the radar sets. When they can be properly installed, the sound and flash ranging bases and the radars can operate efficiently though their effective ranges may be reduced.

3-18. Offense and Defense

See FM 6-20-1 for the principles of the employment of artillery in the offense and defense.

3-19. Targets

Targets are hard to locate. After locating suspected targets, it may be necessary to blast away jungle undergrowth by means of air bursts and tree bursts before maximum effect on the target can be obtained. This will often require expenditures of large quantities of ammunition. Caves and pillbox emplacements can be destroyed by field artillery missiles or by heavy and medium artillery used in a direct fire role. Chemical shells may be used for casualty effect or to force individuals from prepared positions that are relatively invulnerable to other weapons. In adjusting artillery, the first round should be white phosphorous with a height of burst of 200 meters to preclude the first artillery rounds landing on friendly troops.

3-20. Ammunition

a. Special care must be taken to protect ammunition from dampness and deterioration in jungle climate. See FM 9-6, FM 31-45, and TM 9-1300-206.

b. The selection of types of ammunition and fuzes for targets in the jungle is the same as for similar targets in normal locations except that:

(1) The burst or proximity (VT) fuze is difficult to spot in adjustment and is generally ineffective because of the reduction of fragmentation effect in the tree canopy. The performance of this fuze can be greatly improved through the use of "desensitizing" caps which can be fitted over the VT fuze before firing.

(2) Time fuze adjustment is difficult, even in

shrub and grass areas because the vegetation prevents observation of the ground effects.

(3) The delay fuze is valuable for obtaining bursts on or near ground level when foliage is high and thick.

(4) Fuze quick is effective in low tree canopy or grassland, often giving tree bursts at a desirable height with the bonus effect of tree splintering and eliminating snipers in the trees.

(5) Smoke or WP is valuable for use in adjustments and marking targets for air strikes, especially for aerial observation.

(6) Chemical shells can be effectively employed to produce casualties because the high temperature and low wind speeds prevalent below the jungle canopy help to maintain high vapor concentrations of the chemical agent.

3-21. Communication

a. Wire is the most mechanically reliable means of communications for controlling artillery in jungle operations; however, it is difficult to install and maintain. Light wire can be laid on top of foliage by army aircraft. Security of an extensive wire net is difficult and may preclude its use for other than very routine communications.

b. The range of radios is shortened by jungle growth, but this problem may be partly solved by using radio relay stations, both air and ground.

3-22. Survey

a. Since adequate maps do not exist for most areas in jungles, the establishment of survey control is an important consideration.

b. Survey control is usually feasible and can keep up with the forward elements, though it is more difficult and time consuming.

c. Target area survey is usually very restricted or impossible.

d. Triangulation, resection and trilateration techniques are most difficult since line-of-sight is extremely short or nonexistent.

3-23. Fire Control

Fire control is centralized whenever possible; however, decentralization of control will be necessary as the density of the jungle increases and communications become more difficult. As a result, batteries may sometimes operate alone.

Section IV. Air Defense and Air Defense Artillery

3-24. Air Defense of Army Units

a. General. Commanders at all echelons must consider defense of their commands from observation and attack by hostile aircraft. Although much of the air defense will be provided by tactical Air Force and air defense artillery units, all unit commanders must employ active and passive air defense measures to augment this defense.

b. Active Air Defense.

(1) The air defense capability of nonair defense weapons should not be overlooked when planning for air defense. Rifles, automatic weapons, and other nonair defense weapons in the hands of properly trained personnel exercising the right of self-defense against low-flying hostile aircraft can materially reduce the effectiveness of the low-altitude threat. While dense vegetation within a jungle may offer concealment from aerial observation and attack, it will also limit the fields of fire of weapons used in air defense (dense vegetation will not prevent detection by infrared sensors). Although the right of self-defense is never denied, fire at hostile aircraft should be controlled by commanders to insure that position locations are not compromised.

(2) Most combat units, and some combat support units, will have the Redeye guided missile system available to provide local air defense. In jungle operations, Redeye can also be used in the base defense role. However, Redeye's limitations against high-performance aircraft make it less than an optimum base defense weapon and fighter-interceptor support of base areas is required. As defended areas increase in size and importance, augmentation by air defense artillery weapon systems is required. Conditions normally found in jungle areas, such as high humidity, may cause the range capability of the Redeye guided missile system to be reduced.

c. Passive Air Defense. The active air defense effort must be supported by the maximum practicable use of passive air defense self-protection measures; i.e., cover, concealment, dispersion, deception, warning signals, electronic security, and blackout discipline. This is especially important in jungle operations because of the austere and widely dispersed forces employed. Portions of these forces will often find themselves without an effective air defense capability.

involved in the employment of air defense artillery (ADA) will not change greatly in jungle operations (FM 44-1 and FM 100-5). Extensive detailed planning is required before an operation to determine the amount, type, and most effective employment of ADA. Air defense must be provided for ports, beachheads, and advance bases which are the starting points for offensive jungle operations. As the operation progresses, air defense must be planned and provided according to priority for installations, troop concentrations, airfields and other activities subject to aerial observation and attack. Two important factors to be considered in planning and selecting ADA positions are:

(1) Installations subject to ground attack. In the early phases of an operation, ADA deployment is limited by a defendable perimeter. ADA must remain within the main perimeter or be provided with a strong local defense. The extent to which security is developed requires an understanding of jungle characteristics. To a determined attacker there are no impenetrable jungles, impassable swamps, unfordable rivers, or unscalable cliffs. The commander must not assume that his position is protected by such obstacles. ADA unit commanders must make a thorough terrain analysis of the area they are to occupy and apply the principles of perimeter defense. The limited fields of observation and the concealment afforded by the jungle allow the enemy to approach the position without detection. Infiltration is easy and there is great danger of attack from all directions. The dense jungle imposes severe limitations on the use of defensive weapons because observation and fields of fire are often limited to several meters. The proper use of all security measures such as listening posts, warning devices, and thorough and continuous patrolling are required to protect the command.

(2) Installations relatively secure from ground attack. In defending existing installations in friendly territory or the expansion of defenses in captured territory well behind the combat zone, the preparation and occupation of such defensive positions are relatively deliberate. Position areas should be selected to maximize the capabilities and minimize the limitations of equipment employed. Roads may not be present and sites may require extensive preparation at the time positive areas are selected. Local security must be provided and the same considerations as outlined in (1) above must be applied.

3-25. Air Defense Artillery

a. General. The basic tactics and techniques in-

b. Employment.

(1) There will normally be a requirement for both ADA missile and gun systems to provide complete high and low altitude air defense artillery coverage at ports, beachheads, and other areas used as forward bases for jungle operations. ADA systems which may be used include the Nike Hercules, Hawk, and Chaparral missile systems and the Vulcan, the twin 40mm self-propelled gun (M42), and the multiple caliber .50 machinegun (M55) gun systems. Chaparral and all gun systems are designated as forward area weapons (FAW). Under some circumstances the SP Hawk may be deployed in the forward area. The size and weight of most ADA equipment causes serious problems in movement through the jungle and until such time as the heavier ADA weapons can be deployed forward installations must depend upon tactical aircraft for defense from high altitude aerial attack. Siting of ADA systems dependent on radar for fire control is much more critical than those that do not use radar. Gun systems can frequently be sited to fire on ground and waterborne targets in addition to hostile aircraft. However, ADA weapons having both a surface-to-air and surface-to-surface capability will never be given both a surface and air defense mission simultaneously. This does not preclude firing in self-defense against either enemy air or ground forces. Construction equipment must be available, not only to prepare roads and sites prior to occupation, but also to maintain, improve, and expand the defense. Requirements for construction equipment and personnel are much greater in jungle operations than in other types of operations.

(2) ADA weapon systems used as FAW are more mobile and have fewer technical limitations than other ADA systems. As concentrations of materiel and personnel are greatly restricted in jungles, there will normally be fewer areas requiring ADA protection. Although the number of defended areas will normally decrease in jungle operations, those subject to attack will become increasingly more vital and may justify a higher level of defense than similar installations in other types of operations. The overall requirement for FAW will depend upon the requirements for each operation. In the absence of an air threat and at the discretion of the force commander, gun-type FAW can provide convoy protection, harassing

and interdiction fires, local security, and combat support of operations, and can participate in riverine operations. All gun-type FAW can be airlifted and the M55 can be transported by helicopter. When used in a surface role, gun-type FAW should always be used in conjunction with other combat arms.

c. Resupply. The resupply of ADA units is a tremendous problem in jungle operations. This is particularly true with FAW, all of which use large amount of Class III and V supplies. Usually resupply of isolated ADA units is most practical by helicopter as areas suitable for ADA positions will usually provide space for helicopter landings. In some cases, however, supplies must be hand-carried or delivered by pack animals. Where available, advantage may be taken of waterways through the jungle. Because of the difficulty of resupply in the jungle, commanders must insure that strict conservation measures for all classes of supply are constantly enforced.

d. Degradation of Radar and Communications. Radar performance is greatly degraded because of foliage and terrain. Early warning radars may be displaced so as not to be affected by local conditions.

(1) The limitations imposed by the jungle on communications may cause a greater dependency on wire. Ground wire routes are limited and the few available routes will be heavily traveled, making overhead construction imperative in most cases. Helicopters should be used to lay wire rapidly over the jungle canopy. The talking range of wire on long lines may be reduced by moisture. Such circuits should always be designed on the basis of wet wire transmission factors. Increased capability of hostile infiltration makes telephone security particularly important.

(2) Although radio communication in the jungle is highly desirable, its normal operating range is seriously reduced by dense vegetation and adverse atmospheric conditions. Radio operators must be trained to copy weak signals and to use every expedient possible in constructing and siting antennas. Remote control of equipment may be helpful in gaining a more favorable location of the radio set. Radio sets may have to be hand-transported and hand-operated. Substitution of manpacked sets for vehicular sets may be necessary.

Section V. NAVAL GUNFIRE SUPPORT AND TACTICAL AIR SUPPORT

3-26. Naval Gunfire Support

a. General. U.S. Navy ships operating off shore can provide fast, accurate fire support for ground forces operating in the jungle areas in the vicinity of the coast. Destroyers or smaller inshore fire support ships may be able to provide support along principal jungle rivers. Positions may be restricted by mudflats and sandbars which may extend for several miles from the mouth of the river into the sea. This support can be either direct fire, where the target is visible from the ship, or indirect fire directed by air or ground observers. Because of their mobility, ships can be used to provide fire support over a wide area with little time lost between missions. Their support should be used whenever conditions permit.

b. Request for Naval Gunfire. The request for naval gunfire support (NGFS) is transmitted through normal fire support channels to the nearest fire support coordination center (FSCC) where a naval gunfire liaison officer (NGLO) is located, or the nearest coastal surveillance center (CSC). The CSC or NGLO will complete processing of the request. The NGLO will also make arrangements for the necessary observers or spotters.

c. Considerations. When a unit is conducting combat operations within range of naval gunfire support, a naval spotting team should accompany the maneuvering unit. Observation from the ground is very restricted and augmentation by air observation is necessary. When naval spotters have no available aircraft, an artillery forward observer may have to adjust naval gunfire. See FM 6-40 and FM 31-12 for a detailed discussion of naval gunfire coordination.

3-27. Tactical Air Support

a. Doctrine. Tactical air support includes close air support, tactical air reconnaissance and tactical airlift. Requirements and procedures for requesting close air and tactical air reconnaissance support are outlined in FM 61-100. Procedures for requesting and directing tactical airlift support are outlined in FM 100-27.

b. Close Air Support. Close air support is air action against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces.

(1) Airstrike missions are the backbone of close air support. Heavily armed tactical fighters execute these missions by engaging weapon positions, tanks, troops, vehicles, and other targets in close proximity to the requesting ground unit. As the distance between friendly positions and the target decreases, restraints and the degree of control increases. The Forward Air Controller (FAC) and the attacking aircraft exchange information on the tactical situation, the proximity of the target to friendly positions, and the degree of risk the ground force commander is willing to accept. In jungle operations it is usually best if the FAC is airborne so that he can have visual contact with both the target and the attacking aircraft. All available means must be used to mark both friendly and enemy positions.

(2) The following factors must be considered before requesting close air support in the jungle:

(a) The accuracy with which the target can be located, both from the ground and from the air.

(b) The detail which the target can be described.

(c) The desired effect on the target to be produced by air action.

(d) The position of friendly forces in relation to the target.

(e) The desired timing and duration of the air attack.

(f) The communications and control measures (e.g. smoke panels, etc.) available to control the air attack.

(3) Column cover is cover of a column of ground forces by aircraft which provide protection by reconnaissance and attack of targets which threaten the column. Aircraft can be used to neutralize elements of potential enemy resistance before these elements can be brought into contact against friendly forces, and can be employed effectively to attack potential ambush points which could pose a threat to convoys supporting lines of communications in environments without stabilized front lines.

(4) Air cover may be provided for tactical aircraft formations during airborne or airmobile operations. The covering aircraft provide defense against an enemy air threat and attack ground targets along the routes into the landing or drop zones. The aircraft are also employed to neutralize targets within and in the vicinity of the objec-

tive area just prior to the airmobile/airborne assault. In addition, they can be stationed over the objective area to be available during the initial and very critical phase of the ground assault or to provide security for the helicopter withdrawal.

c. *Tactical Airlift.* Tactical airlift forces move combat forces and sustaining materiel under widely varying situations ranging from small movements in battle to large movements over long distances. One of the most critical factors in establishing an air line of communication (ALOC) is the location, selection and construction of suitable landing zones (LZ), pickup zones (PZ) and drop zones (DZ). The site selection for a network or grid pattern of these zones should be accomplished at the outset of an operation. The aircraft mission encompasses these basic tasks:

- (1) Logistical airlift operations.
- (2) Airborne operations.
- (3) Tactical aeromedical evacuation.

(4) Special air support operations. Because of the nature of their airframe, airlift aircraft have the capability or adaptability to accomplish such special missions as flare drops, air strikes, command and control missions, loudspeaker missions, and leaflet drops.

d. *Tactical Air Reconnaissance.* Air reconnaissance of various target types is accomplished by different reconnaissance methods in keeping with the target characteristics. Targets are often covered by more than one mode of reconnaissance. The general methods of reconnaissance are:

(1) *Visual.* Benefits to be derived from visual reconnaissance are minimized in primary jungle areas due to the cover of the canopy. Elsewhere, however, visual reconnaissance can be of great value, particularly if conducted over the

same areas by the same pilots for extended periods of time. There are four general categories of visual reconnaissance—area search, specific search, route reconnaissance, and weapons fire adjustment.

(2) *Imagery.* Recorded images of various kinds are required whenever visual reconnaissance does not suffice or becomes impractical. The principal image types are:

(a) *Optical.* Optical images result in excellent photographs, but they require some degree of illumination and are severely restricted by adverse weather. Night optical imagery requires artificial illumination and is generally restricted to low altitudes.

(b) *Thermographic.* Thermographs are not dependent upon light conditions and prominently record objects having a temperature differential with the surrounding area. The infrared images may be instantly recorded or transmitted to a ground station. Severe degradation, however, can be expected if fog, clouds, or other weather phenomena exist.

(c) *Radographic.* This imagery is also independent of light conditions and is practically independent of weather conditions. Radographs lack the fine detail of optical images and thermographs, but moving objects can be specifically identified, and extremely large areas can be imaged at small scale.

(3) *Electronic.* Electronic reconnaissance is the interception and analysis of hostile electronic emissions in order to gain intelligence of enemy activities, capabilities, deployment, strength, and intentions. Signals from enemy communications emitters and radar are highly vulnerable to intelligence collection, processing and dissemination techniques.

Section VI. ARMY AVIATION

3-28. General

The jungle environment, with its limited road network, dense vegetation, and rugged mountainous areas, offers an excellent opportunity to capitalize on aviation support. Army aircraft can perform reconnaissance missions, facilitate command and control, transport men and equipment, and perform many other important tasks that may be otherwise impracticable. Use of airmobile forces enables commanders to move troops and equipment over extended distances and over terrain obstacles, capitalizing on surprise and maneuver to gain an advantage over the enemy. Riv-

erine operations can be enhanced through the employment of supporting aviation elements. Missions that can be accomplished during jungle operations by aviation elements require imagination, thorough planning, and knowledge of the capabilities and limitations of supporting aviation on the part of commanders and staff officers at all levels.

3-29. Uses of Army Aviation

Army aviation augments the capability of the Army to conduct prompt and sustained combat incident to operations on land. The advantages to be gained by the proper utilization of Army avia-

tion in jungle operations are especially significant. Some of the tasks Army aviation may perform in jungle areas are as follows:

a. Intelligence. Army aviation provides the ground commander with an increased capability for gathering intelligence in the jungle environment. Aircraft may be used to conduct visual, photographic, or electronic observation into areas which are relatively inaccessible to ground reconnaissance units. Aerial observers can detect likely points of ambush, and provide information for use by friendly troops in avoiding or countering the ambush. Hand held cameras may be used by aerial observers to supplement visual reconnaissance. Infrared sensors mounted in aircraft will obtain target indications through light jungle foliage that are not possible by visual means or aerial photography. Airborne personnel detector devices, when operated in aircraft at altitudes just above the jungle canopy, analyze the air and detect airborne products indicative of human habitation below the canopy. Unattended ground sensors may be used to gain information on enemy movement. The side looking aerial radar (SLAR) may be used to provide surveillance of routes, zones, or areas where the vegetation is not too dense. It is particularly valuable during inclement weather when black and white photography and infrared imagery quality is greatly reduced. The SLAR may also be utilized effectively for night surveillance of coastal, river, and canal traffic.

b. Mobility. Military operations in jungle areas are characterized by reduced maneuverability of ground elements. This disadvantage may be offset or minimized by augmenting ground forces with Army aviation units. These units provide an additional means of maneuver by airlifting troops and equipment in airmobile operations. The rapidity with which airmobile forces can react makes them particularly effective in jungle operations where the enemy may mass for only a short time and then quickly disperse. Airmobile units permit combat troops to be moved swiftly over obstacles and landed on or near the objective without the fatigue which accompanies long marches through jungle terrain. In areas where adequate landing zones are not available, troops may descend from hovering helicopters using ropes and ladders. Supporting weapons can be rapidly lifted by helicopters to areas which would be inaccessible by ground routes.

c. Firepower. Attack helicopters organic to Army aviation units are capable of providing responsive, discriminatory fire support necessary to

support jungle operations. They may be assigned escort, reconnaissance and security, and direct fire support missions. They are especially adaptable in providing escort to ground convoys on jungle routes. They can perform reconnaissance along the route, and provide early warning of possible ambush or attack. Attack helicopters are appropriately armed to immediately attack and neutralize ambush forces. The presence of inadequate surface routes and formidable terrain obstacles normally found in the jungle makes the movement of conventional fire support means more difficult; cargo helicopters can be utilized to move artillery units within the battle area. Artillery units can be moved rapidly by helicopter to a pre-selected area, fire a preplanned mission, then be recovered and returned to base area by helicopter. This technique, "The Artillery Raid", is effective in an interdiction role and extends the effective range of artillery and the area of influence of the division. Attack helicopters may occasionally provide the only fire support available to isolated forces. They can operate directly with ground forces and provide direct fire support during periods of low visibility and ceilings which limit the effectiveness of high performance aircraft. Attack helicopters supported by searchlight-equipped helicopters are particularly effective for patrolling jungle rivers and canals at night.

d. Command, Control, and Communications. The problems of command and control are greatly increased in jungle operations. The organic communications and aerial visual surveillance capability or airmobile elements exceed those of conventional ground forces. The aerial command post and communications facilities employed by airmobile forces enable command and control functions to be exercised over widely separated units. Army aircraft may act as radio relay stations in areas where the terrain restricts communications among ground stations. When equipped with dispensers, they may also be used to lay wire over dense jungle terrain which severely impedes surface movement. Command and liaison functions are facilitated by the use of aircraft to visit widely separated units.

e. Combat Service Support. The difficulty of securing lines of communications and the lack of an adequate communication network often make it necessary to use an air line of communications to resupply forces engaged in jungle operations by air lines of communications. Because helicopters are less dependent upon improved landing areas

than fixed wing airplanes, they may be more suitable for providing aerial resupply and for evacuating casualties. Use of aircraft in this type of operation can normally be accomplished with less exposure time to enemy ambush than that experienced in the use of surface transportation. Preselection of landing zones and loading areas and coordination with support units are especially important in jungle operations to prevent supplies from falling into enemy hands. The helicopter also is a swift, flexible means for casualty evacuation. The knowledge that such a means exists enhances the morale of troops operating in areas inaccessible to other evacuation means.

3-30. Special Consideration Affecting Employment

There are similarities in planning for the use of aviation resources in all environments. The jungle environment with its special terrain and weather factors introduces problems that deserve special mention to the planner and operator. These factors are listed below:

a. Weather Factors. Jungle areas are characterized by heat, humidity, monsoon seasons and other weather phenomena that seriously affect the performance characteristics of aircraft, particularly helicopters. High density altitude decreases the lift capability of helicopters and increases the take-off and landing roll required for fixed wing airplanes. These factors, coupled with small landing areas with high barriers, often cause significant reductions in loads that can be carried by aircraft. The aviation liaison officer can provide valuable assistance to supported units during planning and operations. Consideration should be given to the number of aircraft available as compared to the number required for the mission, how many lifts will be required, and possible reduction in range or increase in frequency of refueling operations.

b. Base Areas. Base areas large enough to fill requirements for refueling points, rearming points for armed helicopters, maintenance areas, and to allow for dispersion of aircraft must be established for aviation units. Because of the size required of these base areas and the requirement for security, main bases of operation will normally be in a relatively secure area. The majority of the aircraft return to the base area each night.

c. Forward Areas. Forward base areas should normally be established within the supported brigade or battalion area. These bases will contain forward refueling and rearming points and must

be provided security by the supported unit. A limited number of aircraft may remain in the forward base overnight to provide a rapid reaction capability.

d. Downed Aircraft Procedures. Plans should be developed for the rescue of downed aviators and the security and recovery of downed aircraft. Security forces, including aircraft, should be designated for this security and recovery mission. These forces may continue on their assigned missions, with the recovery mission as a contingency task, or they may be held on a standby basis. The criticality of the mission and the availability of resources will determine the technique employed.

e. Pickup and Landing Zones (PZ and LZ.) Pickup and landing zones are generally limited in jungle areas, both in number and size. A continuous collection effort should be made to locate LZ and PZ for possible future use. Examples of LZ and PZ found in jungle areas are ridges, rice paddies, cultivated areas, stream beds, bomb craters, and plantations. Troops may be required to enter a landing zone by rappelling or use of the trooper ladder to improve the LZ or PZ prior to arrival of the main force. An LZ may be so small as to allow use by only one or two aircraft at a time. In this case a thorough analysis of enemy capabilities must be made to determine whether the risk of landing so few men at one time is acceptable. The chance of an aircraft being downed in a small LZ must be considered. Should this event occur, it may be impossible to get more aircraft into the LZ because it is blocked by the downed aircraft. Plans must be made to support personnel in the LZ either by attack helicopters, artillery, tactical air forces or by movement of troops by land. Use of the trooper ladder for the extraction of these troops from the LZ should be considered; however, both troops and aircraft are highly vulnerable during this process. LZ and PZ often must be organized so as to provide for an artillery firing position, an aviation refueling and rearming area, and a brigade or battalion headquarters and trains area. It is evident that in such cases, the area will be crowded, vulnerable to enemy attack, and difficult to control. Plans for the use of available space and the control of the area must be thorough and well coordinated.

f. Pathfinder Personnel. Assigned to aviation units and trained to provide control and guidance to Army aircraft, pathfinder personnel are a valuable asset to ground forces. Wherever possible, they should be placed in landing zones before the main body to remove or mark obstacles, and

thereafter to provide control of landing aircraft. Pathfinder personnel will often move from the landing zone with the infantry when a landing zone is abandoned. Pathfinders are familiar with the capabilities and limitations of the supporting aircraft and should be used to assist in loading zone as well as landing zone operations. They can assist in getting troops into aircraft in the proper sequence and organizing the pickup zone for pickup of supplies, artillery, sling loads and troops.

g. Fire Support.

(1) *Landing Zone Preparation.* Preparatory fires should be delivered on landing zones whenever enemy activity or occupation is suspected. The scarcity of landing zones in the jungle areas enables the enemy to cover a high percentage of those available with fire. LZ's may also be booby-trapped with mines, punji stakes, or tall stakes set up to strike helicopter rotor blades. Artillery fires are shifted at the last possible moment, allowing aerial rocket artillery followed by attack helicopters to maintain continuous fire on enemy troops near the LZ until the assaulting troops can bring their own organic weapons to bear on the enemy. Supporting fire should be controlled by personnel in the command helicopter. Planning of such fire support must include a detailed time schedule and must be thoroughly coordinated among all elements participating in the operation. Unattended ground sensors positioned in or within the vicinity of the proposed landing zone(s) can provide information concerning enemy activity or the absence thereof; thus, it may not be necessary to use preparatory fires.

(2) *En route.* Whenever possible, scheduled and/or on-call artillery fire and close air support should be planned along the flight routes of helicopter units. These concentrations are planned on likely locations along the route from which enemy troops can direct effective fire at the helicopter formations. Plans must be coordinated with the appropriate aviation commander to promote effectiveness of fire and safety of flight.

h. Resupply. Plans for resupply must include arrangements for large volumes of fuel and ammunition for supporting aviation forces. Supplies should be brought as far forward as possible with breakdown being accomplished as far to the rear as possible. As required, helicopter lifts should be used to transport water, rations, ammunition and other supplies to committed and other forward elements. These may be the same helicopters that were used initially in the assault.

3-31. Stability Operations Employment

a. General. Army aviation units are well suited for participation in stability operations in the jungle environment. They can conduct surveillance over wide areas, and provide troop lift, fire support, resupply, and command control facilities throughout jungle areas. Airmobile forces are particularly valuable in the conduct of widely separated actions against insurgent elements. Airmobile forces, relatively unimpeded by terrain obstacles, provide a freedom of action unequaled by other ground units. The flexibility of organization and inherent capabilities of Army aviation units enable them to provide responsive support through the full range of internal defense and internal development operations.

b. Internal Defense Operations.

(1) The nature of internal defense operations, coupled with poor road networks and rugged jungle terrain, creates a mobility disadvantage for forces designed and trained to conduct conventional military operations which Army aviation can assist in reducing. Army aviation units may be required to provide support to host country forces to reinforce its internal defense effort. In advanced insurgency situations where U.S. combat elements are necessary, aviation units may support both U.S. and host country forces. Separate aviation companies and battalions normally provide support to host country forces with operational control being retained by the senior U.S. officer involved in the operation. In situations where U.S. Advisor assistance is being furnished, Army aviation can provide personnel and units for mobile training teams to instruct, advise, and train host country forces in aviation and related activities. Aviation support for U.S. combat forces conducting internal defense assistance operations is normally provided by organic Army aviation units.

(2) Airmobile resources give commanders the flexibility necessary to meet the wide range of the insurgent threat in jungle areas. Airmobile forces may be rapidly tailored into combined arms task forces capable of conducting semi-independent operations. The organization is based on the insurgent forces operating in the area, the size of the area over which surveillance is to be maintained, and other factors, such as terrain and weather. The mobility of the airmobile force, as contrasted to the mobility of the insurgents, enables it to initially locate, maintain contact with, and employ combat power against these elusive elements. The normal organic transportation of

airmobile units can also be used in supporting these operations against insurgent forces in the jungle. Air lines of communication (ALOC) may be employed to reduce the problems of difficult terrain, lack of adequate lines of communication, and attack of ground supply convoys.

(3) A small tactical force may be organized to provide an immediate reaction or pursuit capability to be used in conjunction with other airmobile or ground operations. This force is of approximately platoon strength supported by an appropriate number of transport helicopters with a section, team, or platoon of armed helicopters. The speed of reaction of this force, when on air-born alert, enables it to strike insurgent forces before they can fade into the protective cover of the jungle or merge with the local populace.

(4) Direct fire support provided by attack helicopters can be used to extend and complement the fire of ground forces during stability operations. The ability of the attack helicopter to operate with ground forces in the jungle often makes it the most rapid means available for bringing firepower to bear on the insurgents. Positive identification of hostile targets is one of the most difficult as well as important tasks in internal defense assistance operations. The close-in, discriminatory fire support provided by attack helicopters is particularly effective in this type operation.

(5) The impact of airmobile operations may provide important psychological warfare material in internal defense operations. Airmobile forces with their modern, sophisticated equipment are especially effective as a demonstration force. The number and type of aircraft in an airmobile force are impressive when they are maneuvered in jungle areas where aircraft are not commonplace. Aviation units may also provide assistance to the psychological operations (PSYOPS) effort by transporting PSYOPS personnel to hamlets located in remote areas of the jungle. Loudspeakers can be mounted on aircraft and used to disseminate propaganda and information to villagers. Leaflets can be dispersed from Army aircraft flying over the target area.

c. Internal Development Operations.

(1) Army aviation units, in addition to fur-

nishing support to host country and U.S. forces, may be tasked with assisting internal development operations. Because of their lack of sensitivity to terrain conditions, these units are highly effective in providing assistance in remote jungle areas. They can transport medical, agricultural, and other teams whose mission is to improve the social, political, and economic conditions of isolated villages and hamlets. Transportation of supplies and equipment over surface lines of communication may be limited by road or rail capacity, by insurgent activity, and by shortages of transportation equipment. Army aviation will frequently be the most effective means of moving critically needed items to these areas.

(2) Security and damage control operations are particularly important during internal development operations. Measures must be taken to prevent insurgent forces from capturing supplies and equipment belonging to friendly elements. Damage to supply installations from attack and sabotage must be minimized. Airmobile forces can provide security in internal development assistance operations by performing ground and aerial reconnaissance of critical areas, by armed escort of supply convoys, and by conducting airmobile assaults against insurgent elements. Army aviation units can quickly lift damage control teams to threatened logistical installations, thus assisting in saving supplies vital to the development of the host country.

3-32. Riverine Operations

The riverine environment offers an excellent opportunity to capitalize on the superior mobility provided by Army aviation units, particularly helicopters. Aviation units can rapidly introduce troops, fire support, and combat service support into an operational area. The ability of the helicopter to move swiftly over inundated areas, land on small land areas, and perform tasks while hovering over areas in which no land is available, gives supported riverine forces a distinct advantage over forces lacking aviation support. FM 31-75 (Test) provides details on the use of Army aviation support in riverine operations.

Section VII. CHEMICAL, BIOLOGICAL AND RADIOLOGICAL (CBR) OPERATIONS

3-33. General

a. Joint doctrine for the employment of chemi-

cal and biological (CB) agents and guidance for planning the employment of these agents/muni-

tions is contained in FM 3-10. General policy guidance is contained in FM 101-40.

b. Doctrinal guidance in chemical, biological, and nuclear defense is contained in FM 21-40, while FM 21-41 provides the soldier with procedures for individual defense measures against these agents and weapons.

c. Employment of CB agent/munition systems in jungle terrain will not differ significantly from techniques employed in other types of terrain. However, because such factors as meteorological conditions, terrain, and vegetation do influence the behavior and effectiveness of CB agents, these factors must be taken in consideration for jungle terrain. FM 3-10 and TM 3-240 discuss micrometeorological factors in detail. Thus, in general, the key to predicting the behavior and effectiveness of CB agents is a correct micrometeorological forecast.

3-34. Chemical Agents

a. *Lethal Chemical Agents.* Nerve agents GB and VX and blister agent HD are the current antipersonnel chemical agents considered for employment in chemical operations. These agents may be delivered on target by such delivery means as mortars, artillery, rockets, missiles, bombs, or aircraft spray tanks.

(1) Nerve agent GB is employed as a non-persistent vapor to cause casualties upon inhalation, or to harass enemy troops.

(2) Nerve agent VX is used to contaminate troops, terrain and materiel and is extremely effective in jungle when used against troops who are not wearing complete protective clothing and equipment.

(3) Blister agent HD is used to contaminate troops, terrain and materiel. It is extremely effective in the jungle when used against troops who are not wearing complete protective clothing and equipment. Meteorological conditions in the jungle are favorable for the production and maintenance of a high vapor concentration of this agent and droplets of HD on foliage and the ground present a relatively persistent hazard to troops in the area.

(4) See FM 3-10 and TM 3-240 for details on the employment of chemical agents and the effects of weather and terrain on the behavior of chemical agents.

b. *Nonlethal Chemical Agents.* The current incapacitating agent is BZ while the family of riot control agents (RCA) includes CS, CS1, CS2, CN, CN1, DM and CM1. As with the lethal chemical

agents, delivery means include mortars, artillery, bombs and aircraft rockets and spray tanks. Riot control agents are also dispersed by dispensers. FM 3-10 and TC 3-16 contain details on employment of these agents.

c. *Land Mines.* VX-filled and HD-filled land mines can be used effectively, when authorized by appropriate commanders, to mine and boobytrap trails used by the enemy or leading into friendly defensive positions. The mines need to be protected from rust and fuzes and detonators must be protected from moisture and mildew. Care must be taken that trip wires are not fouled by rapid growth of jungle foliage.

d. *Toxic Chemical Agents.* Artillery projectiles and aerial bombs with delay fuzes are the most effective means of delivering toxic chemical agents in the jungle. Artillery projectiles bursting more than 40 feet in the air result in loss of the agent; the average loss of chemical agent when delay fuzes are not used is about 25 percent. Aerial spray of chemical agents VX and HD is not very effective due to the jungle canopy.

e. *Troop Safety.* When toxic chemical agents are employed in jungle, friendly troop safety is an important consideration not only against contaminated terrain but against downwind vapor hazards. (Chemical munition requirements can be found in FM 3-10.)

f. *Incapacitating and Riot Control Agents.* Doctrinal guidance for the employment of incapacitating agents and riot control agents can be found in FM 3-10.

(1) Incapacitating agent BZ can be employed against enemy troops when it is militarily or politically imprudent to employ toxic chemical agents.

(2) Riot control agents may be used in counter-guerrilla operations, in controlling rebellious prisoners of war, and in subduing rioting civilians. See TC 3-16 for details on employment.

g. *CS Powder.* CS powder due to its increased persistence over a period of several months is a good agent to use in rendering enemy "spider holes," trenches, and tunnels uninhabitable where time or capability does not permit destruction of these enemy positions.

3-35. Smoke and Flame Weapons

a. Smoke may be used for signaling, for marking targets and for providing smokescreens, curtains, and obscuring smoke. Colored smoke grenades and shells are useful for signaling or marking purposes. Limitations on visibility in the

jungle and color will govern their use. For example, smoke streamer rifle grenades projected above the jungle canopy may not be visible to ground troops, but they can be useful signals to air observers and to specially located ground observers.

b. Smokescreens and curtains produced by mechanical generators, smoke pots, shells, rockets, or aerial bombs may be used to limit air and ground observation when the vegetation and tree top canopy are not dense enough to give concealment. Smoke sprayed from airplane smoke tanks will generally be ineffective in jungle operations because of turbulent air currents above the jungle canopy which rapidly disperses the smoke. Smoke curtains produced by artillery and mortar shells can be employed effectively by ground troops in the attack. Enemy individual bunkers and isolated strong points can have their vision obscured by the use of HC and White Phosphorous (WP) grenades prior to assault. WP may have an incendiary effect plus a casualty and demoralizing effect which may be desirable.

c. Flame is a valuable weapon to be used in jungle operations. Flame weapons are employed principally in the reduction of fortified positions and to counter mass attacks. Flame weapons may be used to produce casualties and provide close-in battle illumination, and they may also be used for the incendiary effects (i.e., burning, the natural concealment and camouflage afforded by the vegetation). Flamethrowers and fire bombs delivered by tactical air are effective methods of employing flame in this type of terrain. Artillery, mortars, and rockets are effective methods of employing incendiaries. Flame field expedients (i.e., flame landmines, flame fougasse, flame illuminators), prepared locally from empty fuel drums or other containers filled with thickened fuel, can be used defensively against infiltrating or attacking enemy forces for warning effect, casualty effect, and for battlefield illumination. (See FM 20-33.)

3-36. Biological Agents

a. *General.* Biological agents are microorganisms that are effective against men, animals and plants. Biological agents can be used effectively in the jungle to produce casualties in troops or to cause the destruction of crops, without the massive destructive effects of nuclear or high explosive weapons. See TM 3-216 for technical data of biological agents.

b. *Antipersonnel Agents.* Natural jungle conditions such as high humidity and diffused, tinted

sunlight decrease the decay rate of biological agents and therefore, these conditions are conducive to the effective employment of biological agents. Area coverage of biological agents disseminated below the jungle canopy is reduced because of wind speed. Biological agents produce delayed casualties and therefore, a detailed plan of employment is required so that their effects are coordinated with tactical operations. See FM 3-10 for doctrinal guidance on the employment of antipersonnel biological agents.

c. *Antiplant Agents.* There are a number of biological agents which can be effective in the jungle against plants, shrubs and trees and against the food and industrial crops produced by them. Biological operations for destroying food supplies in an area may require concurrent planning for subsistence aid and for the protection of friendly troop supplies.

3-37. Chemical Antiplant Agents

Certain chemicals possess an offensive potential for destroying or seriously limiting the production of crops and for defoliating vegetation. The chemical compounds used are either plant growth regulators that modify the normal growth pattern of plants or defoliants that kill or damage the plants. Defoliants can be used to expose ground operations, installations, materiel, and personnel to observation; to mark targets, positions, and tactical coordinating and control lines; and to clear and keep open fields of fire around defensive positions. Destruction of natural vegetation may expose camouflaged activities. Present defoliant agents disseminated by aircraft spray require 4 weeks or longer to be effective against tropical vegetation. Tactical operational planning must allow for this delay factor. See TM 3-215 for technical data on chemical agents, and TC 3-16 for information on employment of defoliants and herbicides.

3-38. Nuclear Weapons Effects

The effects of nuclear explosions will not be significantly affected by the dense jungle vegetation. The blast effect will create considerable tree blow down and missile effects. Tree blow down may severely restrict movement and may increase or decrease fields of fire. During the dry season, fires may be started in dry brush and flammable supplies by the thermal effects. Jungle terrain will not significantly alter the initial nuclear effects. The intensity of radiation from radiological

agents and radioactive fallout may be reduced by extremely heavy vegetation as some of the particles will be retained by the jungle canopy. Subsequent rains may wash these particles to the ground, and concentrate them in water collection areas. Actions required of individuals and units in radiologically contaminated areas are contained in FM 3-12, FM 21-40, and FM 21-41.

3-39. Defense Against CBR Attack

Refer to FM 21-40 for guidance on unit procedures to be used against CBR attack and to FM 21-41 for individual actions against CBR haz-

ards. It should be noted that the protective mask and impermeable protective clothing are barely tolerable in jungle terrain and climate. Limitations on vision imposed by the mask combined with personal discomfort as a result of wearing the protective equipment may decrease individual efficiency and present a morale problem. Proper training is necessary and commanders must consider the decrease in unit effectiveness and the decrease in the tempo of operations caused by the wearing of CBR protective equipment. In addition, special precautions must be taken to maintain unit CBR defensive equipment in usable condition because of the rapid mildew, rot, and rust of these items in jungle areas.

Section VIII. ENGINEERS

3-40. General

Combat engineer support is allocated on the basis of anticipated engineer work as determined by the factors of METT. Combat engineers are used most effectively and efficiently in jungle operations when assigned a direct support mission, however, independent unit actions often require the attachment of engineer units. To enhance speed of movement in large scale jungle operations extensive engineer support will be required. In nearly all jungle areas, roads are relatively undeveloped or nonexistent. These are usually narrow and winding and incapable of supporting sustained military traffic. Air support becomes more important. Major tasks performed by engineers are the construction and maintenance of roads and trails and the construction of airfields, landing zones and supporting facilities. Construction operations in the jungle are extremely vulnerable to enemy activity. Unit security must be established at worksites and often infantry units must be allocated to provide necessary security.

3-41. Planning

a. General. In planning for the utilization of engineer units in jungle operations, consideration is given to the capabilities and equipment of the divisional engineers of the force and the possible requirement for additional engineer support by nondivisional engineer units. Depending on the type and magnitude of the mission, engineer combat battalions (Corps), light equipment companies, land clearing companies, or several of the teams of the TOE 5-500-series, such as the "Well Drilling" or "Forestry" Teams, may be required.

b. Special Requirements. For divisional engineer units, plans must be made for the inclusion of additional demolition equipment, explosives, bangalore torpedos, gasoline driven portable saws and blades, all of which are required in the removal of large trees, tunnel destruction, construction of helipads and landing facilities, and removal of dense vegetation. Additionally, combat service support units must be informed by the force engineer of any special requirements for engineer equipment and supplies for the operation. In determining the equipment and supplies needed, consideration must be given to the rapid disintegration and deterioration of materiel in jungle areas.

3-42. Mapping

Because of the inaccessibility of jungle areas, standard maps may be scarce and those that are available frequently may be inaccurate except for the location of coastlines, principal rivers, built-up areas and primary road nets. The numerous minor swamps, streams, inlets and lagoons are seldom indicated and contours, if shown, are seldom precisely accurate. Trail nets shown can often be depended on, because traditional routes are rarely altered in the jungle; native towns and villages frequently have native names different from those printed on maps and locations change often. Annotated photomosaics, supplemental pictomaps, and other large scale graphics designed to cover inaccessible areas may accurately locate minor swamps, streams, inlets, and lagoons when the map coverage is of relatively flat terrain. The names of towns and villages on pictomaps are

written in the native language to facilitate coordination on the ground. Any information that can be used to correct existing maps should be forwarded to the appropriate headquarters for prompt dissemination. Engineer reconnaissance to supplement map data is of prime importance. The engineers should obtain information on the following: (Engineer reconnaissance should be accomplished as outlined in FM 5-30 and FM 5-36).

- a. Location and condition of roads, trails, railways, and bridges.
- b. Locations for possible road, airfield and facility construction, and construction materials.
- c. High water level of rivers and streams.
- d. Condition of banks at river and stream crossing sites.
- e. Location of water sources for drinking, laundering, and bathing.
- f. Cross-country trafficability data for wheeled and armored vehicles.
- g. Soil trafficability.
- h. Location of actual and potential obstacles and barriers.

3-43. Road Construction

a. There are numerous factors that complicate road construction in the jungle. The heavy rainfall imposes a drainage problem of major concern. Whenever possible, low ground should be avoided in laying out a road. When it is impossible to bypass low, swampy ground, it may be necessary to construct pontoon bridges or long sections of corduroy road. It is advisable to cut the right of way much wider than normal so the sun can dry out the road bed. The enlarged right of way also provides room for the construction of ditches necessary to keep the subgrade drained. Large ditches constructed with scrapers may be necessary to drain inundated areas near roads and airfields. TM's 5-312 and 5-330, provide detailed information on drainage, site selection and construction of roads.

b. The engineers need heavy construction equipment, and specialized clearing equipment must be procured for supporting engineer units or installations. A particularly valuable piece of equipment for clearing jungle areas is the tree dozer. This vehicle, equipped with a clearing blade shears trees, stumps, and brush at ground level and then piles the cut material into windrows. It leaves a cleared area clean, smooth, and free of stump holes yet with sufficient vegetation to prevent erosion. If the road net will permit, an

alternate route plan is set up so the main roads, or sections of them, may be closed when major repairs are required.

3-44. River Crossing

a. In large scale jungle operations, when time and equipment are available, standard river crossing procedures, bridging, and stream crossing expedients described in FM 31-60 are applicable. In small scale operations, or as field expedients, rope suspension bridges and suspension cable methods, as described in FM 31-72 and TM 5-210, may be useful.

b. The jungle provides excellent concealment for river crossing operations in most instances. The lack of good road nets on both banks is characteristic of jungle river crossing operations. Troops and hand-carried material can be brought up to almost any desired site without additional road construction. However, when selecting the site, the climatic conditions of the area such as annual rainfall and flooding conditions must be carefully analyzed. Flashfloods are characteristic of most jungle areas, even in the dry season. If heavy equipment is to be used, road construction required and soil trafficability must be considered.

c. Heavy lift helicopters can be used to transport standard bridge components or bridge timbers to sites requiring bridging or bridge repair and also at the site to cross personnel and equipment by airlift until bridging has been installed.

3-45. Water Supply

Water sources are usually abundant, but special treatment is required for purification. See paragraph 6-7d, for health hazards and methods of engineer and individual water treatment.

3-46. Mine Warfare

As the jungle itself is an effective obstacle against vehicles, antitank mines and other antivehicle obstacles are normally confined to roads, trails, and occasional patches of cleared ground. When authorized by appropriate commanders, antipersonnel mines can be effectively employed to delay, stop, and canalize the enemy and to serve as warning devices, the logistical support for mine warfare is very difficult. See FM's 20-32 and 5-31 for additional information on the employment and removal of mines and booby traps.

3-47. Nuclear Weapons

The obstacles resulting from the effects of nuclear weapons in jungle terrain may be easier to bypass than to overcome. In a tactical situation, the time and engineer effort required to cross tree blowdown areas may be excessive. Alternate routes of movement must be planned for, and prepared as soon as possible to provide means for continuing movement despite nuclear attack.

3-48. Additional Considerations

a. Land Clearing Operations. In those jungle areas which permit enemy forces to operate with relative impunity, a requirement will exist to provide tactical forces with a specialized land clearing capability to level dense vegetation which may serve as active or potential sanctuaries for enemy personnel, equipment, supplies and other underground installations, or to clear passages through these areas for lines of communication. To meet this requirement, consideration should be given to the attachment of a specialized engineer land clearing company (TOE 5-87T), to which tree dozers are organic. Tree dozers are capable of felling trees up to 48 inches in diameter in a matter of minutes.

b. Engineer Land Clearing Company. The mission of the engineer land clearing company is:

(1) To clear extensive dense vegetation in critical areas for the purpose of denying their use by the enemy as bases of operation, supply bases, marshalling areas, ambush sites, and cover and concealment.

(2) To clear dense vegetation from areas adjacent to friendly installation for the purpose of improving installation security by providing observation and fields of fire, and to reduce probability of ambush along land lines of communication.

c. Construction of Helipads and Air Strips. Engineer units organic to or supporting airmobile units, are required to construct helipads and airstrips in remote areas of the jungle in support of

tactical operations. Engineer work crews, equipped with gasoline engine portable saws and demolitions, are airlifted by helicopter to the remote jungle area and rappel to the site. These crews make the initial clearance of trees and underbrush with the saws and demolitions lowered to them from the helicopter. Follow-on engineers, equipped with sectionalized airmobile engineer equipment, are air-lifted to the jungle clearing with their equipment and expand the landing zone or airstrip in accordance with the tactical plan.

d. Destruction of Tunnels and Bunkers. When enemy tunnels and bunkers are located, engineer personnel are charged with their destruction or the denial of their future use by the enemy. This is accomplished by collapsing the tunnels or bunkers with surface cratering charges, or by placing and detonating explosives inside the tunnel, or by filling the tunnels with CS crystals and sealing the entrances.

e. Construction of Artillery Pads in Swampy Areas.

(1) *General.* Engineer units, supporting operations in swampy areas construct all-weather firing surfaces for the use of artillery operating in swampy areas. There are two examples as follows:

(a) *Wooden pad.* This type is of local design and manufacture. They are 10-sided and range from 20 feet in diameter for towed 105mm howitzers to 30 feet by 60 feet oblong octagons for self-propelled 175mm and 8-inch guns. (See FM 5-15.)

(b) *Delta platform.* The delta platform is a hexagonal platform surface 22 feet across and is made of aluminum tubing covered with a walking area of aluminum chain link fencing. Six 20-foot legs extend from the platform at 15 degree angles.

(2) *Other uses.* These pads or platforms may also be used for command posts, troop shelters, first aid stations or heliports.

Section IX. COMMUNICATIONS

3-49. General

Rapid, reliable communications are essential in jungle operations. Command and control, fire support, resupply, evacuation and redeployment are all dependent on effective communications. The importance of establishing and maintaining reliable communications can not be overempha-

sized. For this reason a commander must give communications high priority in his planning and supervision. All available means of communications are used in jungle operations. Although wire is normally the most dependable, a fluid combat situation may limit its use, necessitating reliance on other means of communication. All com-

munications equipment is adversely affected by tropical climatic conditions. Maintenance will have to be performed on a continuous basis to prevent corrosion and fungus growth.

3-50. Employment

Jungle operations place additional demands on the resources of communication units and personnel; tactical and signal units may require augmentation of signal personnel and equipment to accomplish the command and control functions. Besides providing normal tactical communications networks, signal units may have to operate long distance radio sets. Army aircraft will have to be used in many instances to provide a radio relay capability as well as assisting in wire laying operations.

3-51. Impact of the Jungle Environment

a. Messenger Communications.

(1) The speed of surface messengers is severely limited by jungle terrain and vegetation. The lack of roads restricts full use of motor vehicles, and foot messengers will have considerable difficulties with land navigation and natural obstacles. The use of air messengers offers an attractive alternative, but one that is limited by availability of aircraft, scarcity of good landing areas, weather conditions, and the fact that air activity aids the enemy in locating friendly troop areas.

(2) The reliability and speed of surface messengers can be improved by employing them in pairs and by selecting messengers who are competent and resourceful individuals, thoroughly familiar with the environment and who are well trained in the use of map and compass. Depending on the availability of aircraft and landing areas air messengers can provide fast and reliable service.

b. Visual Communications.

(1) Visual means of communication is restricted by the dense vegetation. Commanders will rarely have visual contact with all elements or members of their unit. Certain standard colors of smoke or flare signals have limited use because they blend in with vegetation (green) or offer little contrast with fog or haze (white).

(2) The effectiveness of visual communications can be improved by ensuring that each individual understands the meaning of the signal and passes it on to others in his vicinity. Careful selection of colors (such as red or yellow) which contrast with the background color of the jungle increases the effective range of visual communi-

cations. When a unit is expecting a visual signal at a given time, designated observers can be placed in trees, high ground, or other vantage points.

c. Sound Communications.

(1) Dense vegetation tends to muffle sounds, and battle noises further restrict the use of sound communications.

(2) All personnel must understand the signals used and must be trained to pass on all signals received. To increase range, sounds which contrast with normal jungle background noises should be employed (for example whistling or metallic noises). Conversely, when close to the enemy, sounds which blend with normal jungle noises can be used to increase security. In either case, sound signals should be tested prior to use to determine their range and reliability.

d. Wire Communications.

(1) The heavy rain and high humidity of the tropics reduce the range (about 20 percent) and reliability of wire communications. Wire laying in the jungle requires more time and suitable wire laying routes are limited. The increased cover and concealment make it easier for the enemy to intercept or interrupt wire communications and to ambush maintenance crews. Wire laid by air on top of the jungle canopy is extremely difficult to maintain and recover.

(2) Wire used should be in good condition and installed in trees or from poles. Splices should be carefully made to avoid signal losses when wet. Marginal circuits can be improved by laying two pairs of lines per circuit and by using repeaters or telephone amplifying devices. Speed of laying and security can be increased by use of aircraft. See FM 24-20 for field wire and cable techniques.

e. Radio Communications.

(1) Radio waves are absorbed by the damp and dense vegetation, and it is not unusual for the range of a set operated in the jungle to be reduced by 10 to 25 percent of the normal range. Absorption losses are compounded by the greater atmospheric noise levels and instability of the ionosphere typical of the tropics. Weight and configuration affect the use of man pack radios, while the large vehicular mounted sets have limited mobility because of the scarcity of roads. The jungle environment affects different types of radio propagation in the following manner:

(a) The ground wave (used by short-range, high frequency AF and FM sets) is quickly absorbed and generally limited to less than one mile.

(b) Direct wave or line-of-sight propagation is frequently blocked by vegetation or terrain. Selection of suitable sites for this type of transmission is complicated by difficulties in making reconnaissance and the fact that the best sites may be inaccessible and vulnerable to enemy action.

(c) Sky wave propagation is subject to high atmospheric noise and unstable ionospheric conditions. Further, sky wave antennas usually take more time to install and require fairly large cleared areas which may not be easy to find in the jungle.

(2) In a jungle environment, effective radio communications involve the design and location of antennas. Antennas should be clear of the jungle canopy, an essential condition when dealing with line-of-sight sets. Special purpose antennas (which may be issue items or improvised field expedients) can greatly increase the range and reliability of radio communications in the jungle. Other techniques which may be applied:

(a) Use CW (morse code) mode of operation on AM sets when feasible.

(b) Use long-wire antennas of $\frac{1}{4}$ wave length or greater instead of whip or rod antennas.

(c) Increase power. This is usually of only marginal value as power must be increased many times to obtain a slight increase in range.

(d) Whip antennas when used should be slightly tilted away from distant stations to improve sky wave propagation.

(e) Carefully select frequencies to avoid interference and atmospheric noise.

(f) When feasible, use single sideband sets instead of conventional AM radios as they provide more operating channels and a better power-to-weight ratio.

(g) Use ground or aerial retransmission stations to extend the range of tactical radio sets.

(h) See FM 24-18 FM 24-21, and FM 31-73 for information on other field expedients, techniques, and special antennas.

f. Maintenance.

(1) The jungle environment complicates maintenance, especially at the operator level. The combination of high temperature and humidity cause a quick deterioration of communications equipment. Wire and cable are exposed to the damaging effects of weather, fungus and wildlife, and batteries run down, even in storage.

(2) Thorough and frequent operator maintenance is essential. Air conditioning is highly effective against temperature, humidity and dust

problems. Equipment that is exposed to dampness will dry out faster if it is kept operating, but users of this technique must keep in mind the effects of overheating when the equipment is operated continuously. Deterioration of batteries can be reduced by storing in cool and dry storage, preferably refrigerated.

3-52. Communications in Different Jungle Areas

The communication problems encountered in a jungle environment are generally applicable to all three of the major jungle areas of the world. The most significant variations among these three areas involve atmospheric noise levels, frequency prediction, and radio propagation characteristics. Information on these matters on an area basis can be obtained from USASTRATCOM (ATTN: SCCCE-6, Fort Huachuca, Arizona, 85613). Within each major jungle area there may be a wide variation in types of terrain and vegetation. Limitations are generally severest in upland forest areas; communications in the savanna are considerably easier and may approach normal, while in swampy areas mobility becomes a major problem it may become extremely difficult to find firm ground positions for heavier communications equipment.

3-53. Communications in Jungle Stability Operations

Communications support in jungle stability operations has the following characteristics:

a. Limitations on the normal use of wire and FM radio require a greater dependence on multi-channel VHF radio, including the possible use of terminals below brigade level.

b. Tactical units engaged in stability operations have an increased need for communications, especially at the lower levels. This requirement, coupled with the lowered performance of tactical radio sets in the jungle, may necessitate augmentation of communications resources.

c. Advisory and civic action efforts may be hampered by the host country's obsolete communications equipment whose performance may be only marginal.

d. Signal units may become involved in rehabilitation, maintenance and construction of the host country's communications facilities.

e. Close cooperation with local military communications personnel can provide useful infor-

mation on proven field expedients and optimum frequencies. This is especially true in the case of short and medium range AM radio communications.

f. Isolated signal sites (especially multichannel radio) are both essential and vulnerable in jungle stability operations. Due to weather and terrain these sites may be reached only during certain periods. This requires that each site be self-sustaining and capable of self-defense.

g. Greater use of airborne command posts, aerial retransmission and aircraft in support of tactical operations require an effective air-ground communications system.

3-54. Communications in Jungle Riverine Operations

a. General. Communications in jungle riverine operations require certain changes in normal doctrine and procedures. These changes are not drastic, but do involve specialized application of basic principles to a unique environment. In general, jungle riverine operations will place additional demands on the communications resources of

both signal units and the organic communications platoons and sections of tactical units.

b. Special Considerations. Special communications considerations applicable to riverine operations include:

(1) Emphasis on communications support for tactical units operating in a wide area.

(2) A greater requirement for signal augmentation for tactical unit communications resources.

(3) Less reliance on wire communications and more on radio, with emphasis on the use of the light man-pack sets at the lower tactical unit levels.

(4) Extensive use of multichannel radio, including the possible use of terminals below brigade level.

(5) Knowledge of naval communication organization, procedures and equipment, to include qualification and thorough familiarization with shipboard installed equipment provided for embarked Army units.

(6) Increased maintenance and waterproofing requirements for all communications equipment.

Section X. INTELLIGENCE

3-55. General

The basic principles of combat intelligence and other intelligence operations are applicable in jungle operations. However, certain aspects of intelligence will receive increased emphasis because of the unusual characteristics of the jungle environment. Successful operations in jungle areas will depend on the detailed knowledge of the terrain and climatology as well as its effects on personnel, equipment and supplies, natural and man-made features, and activities. Rough terrain coupled with dense vegetation will impose limitations on collection efforts. Collection planning must be detailed in order to insure adequate coverage of the area of operations. In jungle operations increased emphasis is placed on rapid dissemination of intelligence. Intelligence on a specific jungle area is derived from area and country studies supplemented with operational intelligence collected locally.

3-56. Analysis of the Area of Operations

The analysis of a jungle area of operations involves the same considerations as does the analysis of any other area of operations. The collection

of information on weather and terrain, and their effects on both friendly and enemy courses of action, is a prerequisite to the initiation of an operation in the jungle.

a. Terrain.

(1) Jungle terrain is analyzed in terms of the five military aspects; key terrain, observation and fields of fire, cover and concealment, obstacles, and avenues of approach. These aspects are discussed in paragraphs 5-2*c* and 3-28 through 3-32.

(2) Geodetic and map coverage of most jungle areas is rather limited in coverage and accuracy. This creates a requirement for greater detail in the collection and analysis of terrain information and increases the magnitude of the effort required. Jungle operations are influenced to a large degree by the variations of soil trafficability and the vegetation of the area. These topographic factors are particularly important when considering the cross-country movement of dismounted troops or mechanized units, and when selecting landing/drop zones for airmobile/airborne operations and artillery firing positions. Jungle operations require that all units continuously collect topographic information. Aerial reconnaissance

and aerial photography can provide valuable terrain information; however, when the desired information cannot be obtained by air means, ground collection agencies such as dismounted patrols may be employed to obtain the necessary terrain information.

b. Weather. Periods of rainfall can usually be predicted with accuracy. The frequency and volume of rainfall must be evaluated with respect to its effect on operations; e.g., a heavy volume of rain may prohibit the use of wheeled or tracked vehicles in the area and may impose restrictions on the movement of foot troops. For further details on weather in the jungle areas, see paragraph 5-2c.

3-57. Operations

a. Intelligence Cycle. The general doctrine, methods, and procedures for collection planning, collecting, processing and disseminating, and using intelligence are covered in FM 30-5. The success of jungle combat operations may depend on accurate and timely intelligence which is rapidly disseminated to the user level. The activities connected with intelligence operations follow a four-step cycle oriented on the commander's mission. Special considerations for intelligence production in each step of the cycle during jungle operations are discussed below.

(1) *Collection planning.* As in conventional operations, the objective towards which intelligence activities is directed will be the commander's determination of his intelligence requirements. The commander's intelligence requirements are those facts which he needs to know concerning the weather, terrain, and the enemy in order to successfully execute his assigned mission. These intelligence requirements generally can be divided into two broad categories—essential elements of information (EEI) and other intelligence requirements (OIR).

(a) *Essential Elements of Information* is defined as those critical items of information regarding the enemy and his environment, needed by the commander by a particular time, to relate with other available information and intelligence in order to assist him in reaching a logical decision. Any enemy capability or characteristic of the area which is a governing factor in the commander's decision on the choice of a course of action will be an EEI.

(b) *Other Intelligence Requirements* are defined as command and other staff requirements which do not qualify as EEI.

(c) *Intelligence planning* is a continuous process and the Intelligence Officer must be ready to provide an estimate for the next operation and to revise the current estimate to meet changing operational conditions. He accomplishes this by continually updating the intelligence requirements, by evaluating and preparing the collection plan, by issuance of guidance, orders, and requests to information collection agencies and through a continuous check on the productivity of the collection agencies.

(2) *Collection.* All of the usual sources of information are available in jungle operations. Natives and civilians who live on the fringes of the jungle are possible sources of information. They might be able to provide information on the terrain, enemy movements and dispositions, and logistical support available to the enemy. All available agencies will be utilized to collect information in consonance with their capabilities. Patrols and other small unit actions are extensively employed to locate enemy units. These patrols are often the best agency for the collection of information concerning the terrain and the enemy. Long-range reconnaissance patrols and ambush patrols are employed to a much greater extent in jungle operations and are a good means for collecting information. Because radio is normally essential for communication in jungle operations, radio intercept can be utilized effectively as a collection means, even to lower combat echelons.

(3) *Processing.* The sequence in processing information into intelligence depends upon the nature and the urgency of the information. Although recording of information is usually the first step, there are many instances in jungle combat when recording may occur simultaneously with evaluation and interpretation or even later. This is especially true of information concerning enemy targets. A time lag in the processing of information may mean dissipation of the target.

(4) *Dissemination and use.* The timely dissemination of available intelligence and its immediate use is of vital importance in jungle operations. In order to accomplish this it may be necessary to establish and maintain additional communication means to expedite the dissemination of intelligence. This would also serve to expedite the reporting of information.

b. Counterintelligence. Counterintelligence in jungle operations consists of means to deceive the enemy, deny the enemy information, and detect and expose, or neutralize, the enemy espionage, subversion and sabotage effort. Counterintel-

ligence will assume greater importance when friendly units are operating in jungle areas contiguous to populated areas.

c. Reconnaissance and Surveillance. Reconnaissance and surveillance in jungle operations are discussed in paragraphs 5-5 through 5-7.

Section XI. MILITARY POLICE

3-58. General

Combat support and combat service support functions such as the collection and evacuation of prisoners of war and civilian internees; the control of individuals, refugees, and the civilian populace; the investigation of crime; liaison and coordination with other law enforcement agencies; physical security of installations and movement; and traffic control are routinely regarded as normal to military police missions in support of any type of combat operations. An analysis of each of these functions to determine its pertinence in the jungle environment, the existence and extent of any special problems or considerations involved, the amount of military police resources required for integration in a combined arms organization, and the capability and effectiveness of military police platoon and separate squad elements for providing necessary support during jungle operations must be determined as a part of the normal planning sequence before each operation. Standard support procedures for each type task force organization, e.g., brigade or battalion, may require modification in a jungle environment. Consideration of extended distances between units, the diversities of missions, separation from parent division, security needs of logistical installations and lines of communication requiring a greater decentralization of the control of military police support, an increased reliance upon aircraft support, and the degradation of FM radio communications, all influence and add to the requirements of the military police support organization and procedures needed to augment the task force and its various support activities.

3-59. Command and Control

In more conventional operations military police operate in a relatively secure rear area with wide freedom of movement and safety for deployment in small numbers or even as individuals. These conditions do not exist in jungle operations; consequently, operational methods must be adjusted to fit a new and constantly changing situation with the shift of support emphasis from one functional area to another. For instance, organizational fragmentation down to squad and team level may be necessitated, e.g., one military police

squad minus per battalion task force for investigation of crime and the evacuation of prisoners of war.

3-60. Functional Support Activities

Military police are particularly suited for employment in the following tasks:

a. Handling Prisoners of War and Civilian Internees. In jungle operations the handling of prisoners of war and civilian internees will be in accordance with principles and procedures contained in FM 19-40. Of special significance is the fact that the evacuation of captured personnel from all unit levels can be more practically accomplished by the use of air transportation. The potential of limited combat resources at the task force level can best be enhanced by military police support personnel in processing, guarding, and evacuating captured personnel. The effectiveness of such type support is patent particularly in those situations where captured personnel must be held in the immediate area of operations for overnight periods while awaiting evacuation means.

b. Traffic Control. The volume of traffic movements during jungle operations will be significantly reduced due to the limited road net prohibition of individual vehicle movement, increased delivery of personnel and materiel by air, and constant threat of enemy activity. Accordingly, demands for military police traffic control except in support base areas are proportionately decreased as compared to the amount normally required by brigade operations in more conventional combat operations. As in stability operations, traffic control techniques must be modified to reduce unnecessary exposure to isolated enemy attack by substituting traffic escorts for traffic control points and motor patrols wherever possible. There will normally be a larger number of defiles and crossing sites that will require traffic control. In addition, prescribed distances and intervals between vehicular elements in march columns must be more rigidly maintained to reduce the ambush threat to convoys and to prevent damage to the limited road net. See FM 31-22 for further details of transportation security.

c. Physical Security and Population and Re-

sources Control. Many of the techniques employed for control of the civil populace, through liaison and combined operations with civil law enforcement agencies, are routine military police functions in a stability operation although they are not generally referred to or thought of in this terminology. Enforcement of curfews; checkpoint operations to include identification of individuals and verification of manifests against cargoes; searches of individuals, motor vehicles, boats, buildings and areas; seizure of evidence and contraband; and the conduct of raids, are all routine activities of normal military police operations in the support of the commander. The major differences in the application of these techniques in jungle operations is on the scale in which they are employed to support the mission of the task force commander. Under ideal conditions wherein a well organized, efficient civil police force is already in existence, military police support requirements in the base areas of the commander may be limited to manning checkpoints, security of ground lines of communications, and installation security. In the latter function sentry dog units will have

value in such critical base areas as airfields, munitions storage areas, and other supply dumps. See FM 19-30 for capabilities and advantages of various means of physical security.

d. Criminal Investigation. The investigation of criminal activities while usually initiated by duty military police normally must be accomplished by accredited criminal investigators. Incident rates experienced during brigade and battalion scale operations and criminal investigative support required will depend upon area size of operations, the number and distribution of the civil populace, and the language barrier involved. There is no rule-of-thumb measurement which will constitute guidance for the appropriate deployment of such specialists to battalion-sized units since the provision of such support is always complicated by the extended distances between supporting bases and areas of operations in either jungle or stability operations. However, with greater reliance upon availability of airlift into the areas of operations possible it is more practical to hold this limited resource on call in the nearest base area.

CHAPTER 4

COMBAT SERVICE SUPPORT

Section I. GENERAL

4-1. Purpose

This chapter outlines procedures for combat service support of jungle combat operations to include supply, maintenance, transportation, and combat service support aspects of medical treatment and evacuation, and personnel management and services.

4-2. Basic Considerations

a. The established principles of combat service support apply to jungle operations. Logistics techniques, procedures and organizational concepts must be modified to provide responsive support to combat elements as required by the specific situation.

b. In a jungle environment, movement overland is severely restricted. The configuration of the terrain, density of vegetation, availability of ground lines of communication, and the season have a direct influence on the type of transportation that can be used, and, consequently, on the functioning of the supply, maintenance, and medical evacuation systems, and personnel management and services.

c. Consideration must be accorded increased maintenance requirements resulting from high humidity and temperature; support of small isolated units engaged in independent operations; and requirements for temperature and humidity controlled storage facilities to protect shelf life of climate-sensitive items.

d. The logistical support unit must be so located as to best accomplish its support mission, and must be prepared to provide all or part of their own security.

e. Logistical requirements must be anticipated well in advance of actual needs.

4-3. Organization

Combat operations in the jungles are carried out by small units or task forces operating on an isolated and independent basis. Direct support is provided by a mobile logistic element tailored for and attached to each task force; general support is furnished on an area basis.

a. Direct Support. The function of the direct support element is to provide close and continuous logistic support to customer units of the task force. The direct support element must have cross-country mobility and the capability to sustain the combat operations of the supported unit for a definite period of time without resupply. The composition of the direct support element varies according to the type of unit supported and its peculiarities in equipment.

b. General Support. General support activities in support of jungle operations are established at points that facilitate logistical movements such as waterways, roads, and landing fields, and include supply, maintenance, service elements of the services and medical evacuation and hospitalization capabilities. General support activities are organized to provide backup support to direct support elements of the task force. These general support organizations hold sufficient stockages to support the projected operations, with due consideration to local replenishment cycles, time and distance factors and seasonal resupply considerations; have the capability to operate lines of communication to direct support elements cross-country and by Army aircraft; and have the capability to defend themselves against attack.

Section II. SUPPLY

4-4. General

Planning for combat operations in the jungle will always include consideration of the supply capa-

bility to support the operation. Supply operations will affect combat units in accordance with requirements that supplies be made available in the

right amounts and at the right time and place. Requirements for all classes of supply are affected by jungle conditions.

4-5. Basic Considerations

a. Units engaged in jungle combat operations should be provided only those supplies and equipment essential to the accomplishment of the assigned mission and contingencies which may arise.

b. Sufficient preposition stocks of supplies and equipment should be maintained for each unit to insure the provision of logistical support without interruption.

c. The planning of resupply activities to include long range projection of requirements, must be extremely detailed and accomplished well in advance of actual requirements. Consideration must be given to the delivery means available. At times it may be necessary to use carrying parties.

d. The lack of sufficient as well as secure ground lines of communication in the jungle often requires use of aerial resupply; however, caution must be exercised in the use of aerial resupply to avoid disclosure of positions and loss of surprise.

e. Procedures for requesting items of supply should be simplified and brevity codes should be used whenever possible.

f. Unit distribution of supplies should be employed as far forward as possible.

g. Reconnaissance of supply routes and water points must be continuous, and alternate routes and distribution points must be located and developed.

4-6. Classes of Supply

a. *Class I.* Nonperishable canned, dried or dehydrated items primarily are used during jungle operations under conditions where kitchen facilities, with the exception of refrigeration, are normally available, and the unit is not actively engaged in combat. Rations (individual combat meal, long range patrol, or small detachment rations) normally will be issued to units actively engaged in combat. The number of rations carried by the individual soldier should be determined by such factors as weight, how and in what quantities food can be brought forward, when resupply will be effected, and the estimated duration of the operation. Hot meals (including standard A ration) should be served whenever possible, especially when refrigeration is availa-

ble. Feeding is usually accomplished during daylight because of the danger and difficulty of movement at night and the possibility of enemy ambush or night attacks.

b. *Class II.* In a tropical environment rapid deterioration is a primary consideration in Class II supply; issue clothing, particularly combat boots and socks, last a very short time. For items of this nature, requirements should be estimated well in advance and special provisions should be made for adequate resupply. At battalion level, limited emergency supplies of assorted combat boots, socks, and similar items of short wear periods should be stocked.

c. *Class III.* The supply of Class III items does not initially present a great problem, as relatively few vehicles will be in operation. However, Class IIIA will be required in large amounts. Units must establish Class III distribution points for vehicles and aircraft as required. Tank trucks will be used as far forward as possible; 500 gallon collapsible drums are used for Class III resupply when tank trucks cannot reach the forward areas. When circumstances permit the use of tracked vehicles, planning must include additional POL since tracked vehicles normally have a higher fuel consumption rate when operating in rugged terrain. The use of helicopters to support operations requires that an adequate supply of Class IIIA be available at forward supply bases.

d. *Class IV.* The supply of Class IV items will, for the most part, concern special items of individual and unit equipment. In many cases, the equipment normally authorized a unit will be augmented by additional allowances. The use of large amounts of special equipment and fortification/barrier materiel for defensive positions will be difficult due to transportation problems associated with bringing up such materiel.

e. *Class V.* Because of the weight and bulk involved, the supply of ammunition and explosives often presents the most difficult resupply problem. Close control exercised by all leaders over ammunition expenditures within their units and the employment of the appropriate weapon for the fire mission will assist in eliminating unnecessary ammunition resupply. The nature of the terrain and climatic conditions in the tropics magnify the problems involved in site selection and ammunition storage. Large percentages of the area are not suitable for storage due to area contour. Level, firm ground may be converted to a quagmire overnight as a result of the heavy downpours of rain frequently experienced. Rain

followed by intense heat combine to produce conditions that greatly accelerate the deterioration of ammunition and packing materials. High humidities, coupled with intense heat, sap the strength of operating personnel to reduce the amount of work that can be performed. Rapidly forming fungi attack cloth components such as propellant charge bags and bandoleers. Termites eat through packing materials and wooden dunnage. Combined, these conditions amplify the problems that face ammunition personnel in the tropics. The importance of adequate dunnage, shelter, and ventilation in storing ammunition cannot be overemphasized.

f. Class VI. These are personal demand items (nonmilitary sales items) and should be made available when possible because of their influence on the morale of troops.

g. Class VII. These are major end items: A final combination of end products which is ready for its intended use, e.g., tanks, launchers, shops, and vehicles. Equipment in this category is extremely important to the conduct of operations in a jungle environment because there are few facilities in the jungle for the assembly of heavy items of equipment. Care must be exercised to insure maintenance of these items while in storage so that they will be operational when they are issued to the combat forces. Commanders should make detailed analysis of their needs for specific items of supply in this class, because some of these items may have limited use and application in a jungle environment.

h. Class VIII. These are medical materiel including medical peculiar repair parts. These items are most important to the support of any combat action and particularly to the support of jungle operations. Because the heat and high humidity can cause deterioration and loss of potency of certain medical supplies and medicines, frequent resupply and replacement of these items may be required, and there will be an increased need for refrigeration equipment. There will normally be an increased requirement for antiseptic materiel because the high heat and humidity are conducive to infection.

i. Class IX. These are repair parts (less medical peculiar repair parts), and include all repair parts and components, to include kits, assemblies, and subassemblies (repairable and nonrepairable) required for maintenance support of all equipment. This class of supply takes on added importance in a jungle environment because of the high mortality rate of components of all end items (para 4-7 and 4-8). Commanders at all levels must constantly emphasize and enforce proper maintenance of all types of equipment to prevent excessive usage of repair parts.

j. Class X. This is materiel required to support nonmilitary programs, e.g., agriculture and economic development not included in Classes I-IX. These items are not required for the conduct of conventional combat operations in the jungle; however, they are very important in the conduct of stability operations.

Section III. MAINTENANCE

4-7. General

Maintenance organizations function essentially the same as in other operations. The high humidity and temperature prevalent in jungle areas will increase maintenance requirements. Preventive maintenance is of paramount importance, and the need for continuous command emphasis is more important than in temperate areas. Emphasis is placed on on-site maintenance and the use of aircraft for transporting maintenance teams and repair parts to unit level. Due to greater reliance placed on small unit actions in jungle combat operations, adequate communications becomes increasingly important and the need for responsive signal maintenance support is essential. There is a need for an expanded maintenance float for immediate direct exchange of serviceable for unserviceable items.

4-8. Maintenance Operations

a. Organizational Maintenance. Difficulty of resupply in the jungle demands continuing emphasis on the performance of organizational maintenance. High humidity rusts weapons rapidly, necessitating frequent cleaning. Unnecessary exposure of ammunition causes rapid deterioration. Weekly maintenance, normally performed on signal equipment in a temperate climate, will probably have to be accomplished on a daily basis. Specific instructions on care and maintenance of clothing, equipment and supplies can be found in pertinent field and technical manuals.

b. Direct Support. Direct support maintenance is provided in the area of operations by composite maintenance contact teams. It is normally limited to maintenance tasks that can be completed speedily, without heavy repair equipment or

heavy, bulky repair parts. Contact teams may be assigned to operate forward with the maneuver battalions, or may be held on-call at a base area. Maintenance personnel may be airlifted into the area of operations by helicopter to perform critical on-site repairs. Unserviceable components and end items requiring extensive repairs are evacu-

ated by watercraft, helicopter, or wheel and track vehicles as backhaul loads. No unserviceable equipment of possible value to hostile forces should be left unsecured while awaiting evacuation.

c. General Support. For a discussion of General Support activities, see paragraph 4-3b.

Section IV. MEDICAL

4-9. General

Medical support in jungle operations follows the basic principles and practices of military medicine. Provision of medical treatment and evacuation will be complicated by the extended distances between supporting bases and areas of operations, the independent nature of operation, and inaccessibility of terrain. The manner in which medical units support tactical organizations will depend on the employment of the supported unit and the type of jungle in which they are operating. The relatively high incidence of disability caused by heat, humidity, and insectborne diseases will require increased emphasis on health and sanitation measures. In addition, medical doctors may require orientation on diseases and illnesses peculiar to a certain tropical area. Special precautions will have to be taken in the storage of certain medical supplies and medicines due to heat and high humidity which can cause deterioration and loss of potency. Equipment may require modification to permit maximum efficiency in combat.

4-10. Operation of Medical Units

a. The principles set forth in FM 8-15 should be followed to the extent permitted by the situation; centralized control, when practicable, is more efficient than decentralization. Friendly air superiority coupled with availability of helicopters may greatly reduce the requirement for establishment of aid stations and other intermediate medical support facilities to provide care for serious battle casualties. Aid stations and other intermediate medical support facilities are required for sick call, outpatient care, sanitation supervision, immunizations, and battlefield resuscitation. Air evacuation may not be possible because the enemy capabilities, the weather, or the terrain may prevent the use of aircraft. Medical support planning will have to be based on a consideration of the factors of mission, enemy, troops and terrain (METT). Evacuation plans must be sufficiently flexible to insure the accomplishment of the mission when helicopters are not available.

b. Medical units may require considerable augmentation when supporting jungle operations because of the isolated locations of independent operations and the difficulty in crossing such terrain with patient loads. Wheeled ambulances, in most cases, will have to be replaced by other evacuation means more appropriate for use in the jungle. When difficult terrain and wide dispersal of combat elements dictate the need for splitting of battalion aid stations, additional medical personnel will be required. When a sizeable unit operates from a jungle base camp area, it may be advantageous to collocate a mobile army surgical hospital with it. In jungle terrain, medical evacuation operations may be facilitated by the establishment of collecting points operated by medical aid men at intermediate points along the route of evacuation. This may occur when it is practical to transfer patients from one type of transportation to another such as from litter bearers to ambulances or helicopters. Care must be exercised in the use of these procedures since such small isolated points may be profitable targets for enemy guerrilla action.

4-11. Evacuation

a. General. The evacuation of wounded in jungle warfare presents varied problems. The proportion of litter cases to ambulatory cases is increased in jungle areas since even a slightly wounded individual may find it difficult to traverse the rugged terrain. As a result, the casualty ordinarily classified as "walking wounded" may become a litter case. Since the combination of heat and humidity is conducive to infections, speed of evacuation is vital. Special consideration must be given to the conservation of manpower. Litter hauls must be kept as short as the tactical situation will permit. When evacuation by litter is required, all forward medical installations should be situated as close as possible to the troops supported in order to reduce exhaustingly long litter hauls.

b. Evacuation Means. The equipment and prop-

erty normally prescribed by tables of organization and equipment (TOE) for medical evacuation units may not be the most suitable for jungle operations. TOE vehicles may not be able to traverse the terrain where operations become necessary, and evacuation of patients by litter may be a slow and exhausting task, requiring augmentation of the medical units with many nonmedical personnel. All available methods may be used to augment organic medical evacuation means. They may include tracked vehicles, pack animals, rafts, boats, barges, helicopters and litter bearers. Indigenous personnel may be used as litter bearers when properly supervised by Army Medical Department (AMEDD) personnel. Ground medical evacuation in the jungle will normally be along supply routes, since these routes are usually given all possible protection from the enemy.

(1) *Litters*. All types of litters may be used during operations in the jungle, but when evacuation involves transporting patients over streams, gullies or steep slopes, metal basket litters (mountain type or Stokes litters) offer some advantages over the standard folding litters. Metal basket litters provide more security to the patients during such movements, and in addition, may be readily rigged for use on pack animals. Indigenous personnel used as litter bearers may prefer to use canvas sheets with pole loops attached. The canvas is light and easily carried, and poles may be cut as needed. Litters may also be improvised from clothing, ponchos, shelter halves or other available material.

(2) *Air Evacuation*. The many difficulties of medical evacuation encountered in jungle operations emphasize the advantages of air evacuation. In the jungle, helicopters provide faster, more efficient transportation for casualties than other methods which might be used. The reduction of time between injury and treatment has a direct effect on the time required for recovery and the

final results of the treatment. The use of the most rapid, most comfortable, and the safest means of evacuation is facilitated when landing zones are available close to the battle area; however, in areas where the foliage is dense and no landing zones are available, a helicopter equipped with a cable hoist system can be used for this purpose. In airmobile operations, medical evacuation pilots must be fully briefed on initial landing zones, resupply landing zones and any other pertinent information relating to tactical troop movements. Medical aircraft may orbit over a specific point during the initial phase of an airmobile operation to expedite evacuation during this critical period.

(3) *Principles of Evacuation*. Principles of evacuation are covered in detail in FM 8-35. For principles of evacuation in mountainous jungle terrain, see FM 31-72.

4-12. Medical Supplies and Equipment

Items of medical TOE equipment should be evaluated to determine mission usefulness in a humid tropical climate. Equipment may also require modification to permit maximum efficiency in combat. Medical elements supporting independent unit operations must insure that they have sufficient medical supplies. Provision must be made for resupply when medical supplies drop below the required level. Certain drugs such as penicillin, whole blood, ointments, hydrocortison liquids, sulfa-liquids, etc., have critical storage temperature ranges. To prevent loss of potency and spoilage, provision must be made to provide adequate storage for these drugs. When feasible, an air conditioned storage facility should be used. Cardboard containers used for packing of medical supplies and labels used on bottle drugs and medicines deteriorate and become illegible or fall off after periods of open storage in wet humid climates. Adequate covered storage is an essential requirement for maintenance of these supplies.

Section V. TRANSPORTATION

4-13. General

This section presents only a very basic discussion. Details concerning transportation modes, employment, and related doctrine are contained in manuals of the 55-series. With few exceptions, surface transportation facilities in the humid tropics are poorly developed and have a very limited capability for moving large tonnages of cargo or numbers of personnel for even relatively short

distances. The manpower and materiel resources required for construction, improvement, and maintenance of surface transportation modes in jungle operations, together with security problems, time limitations, and similar related factors, may in many instances be significantly reduced or overcome by using an air line of communications. However, for maximum efficiency, all modes should be considered, and

should be incorporated into an integrated rapid transport system appropriate to the situation and operational requirements.

4-14. Transportation Modes

a. Human Portage.

(1) A basic means of moving supplies and equipment in jungle operations is that of hand-carrying by troops or indigenous personnel. At best, this method is slow and laborious and, particularly when troops are used, is inefficient. Additionally, the carrying party, whether military or indigenous, must include additional personnel as security forces to protect the party from enemy action. Physical conditioning and training of troops in the methods and techniques of load carrying, together with limiting hand carried loads to operational essential items will materially increase troop carrier effectiveness.

(2) The issue pack board is a serviceable carryall. If it is not available, load carrying devices such as the "A" frame used in Korea may be obtained from indigenous sources. One or two man load carrying devices may be improvised from wood, canvas, or rope.

(3) For evacuation of patients, the best litter available is the Stokes metal litter which weighs 31½ pounds. This litter is of rigid construction and will not collapse should one of the bearers fall. Additionally, it can be rappelled down cliffs and used in helicopter hoist recoveries. An expedient litter made from two poles and two fatigue jackets is useful in the event of emergencies.

b. Animal Pack.

(1) Although the U.S. Army is no longer authorized pack animals in the system, they do have a place in jungle transportation and can, in some areas, be obtained by contract or purchase from local sources. Pack animals suitable for use in the several jungle areas of the world include the horse, mule, donkey, water buffalo, and elephant.

(2) The load carried by a pack animal is dependent upon the types of animal used; type, weight and bulk of load; distance to be traveled; terrain; and rate of march. Since there is little forage in the jungle for domesticated animals, their use requires that forage be carried by the animals, thereby reducing the payload.

(3) Use of native handlers with pack animals is desirable in that native handlers are normally more skilled with the animals and, particularly in that troops are thereby released for other duties.

c. Highway and Motor Transport.

(1) Generally speaking, interior roads in jungle areas are rare. Those that exist, although possibly adequate for normal indigenous use, quickly deteriorate under any substantially increased traffic flow. During wet weather most roads become impassable to all vehicle traffic. Even during dry season, continuing engineering effort may be required to insure their usability by military vehicles. Many areas provide nothing more than trails passable only to pack animals or to men on foot. During the rainy season even trails frequently become impassable or, at best, extremely difficult. Except for arterial roads, few bridges exist and most of these are incapable of supporting military vehicles without extensive engineer construction effort. During the rainy season many streams are unfordable by vehicle. The lack of cross connections between existing roads or trails hampers or prevents communications and control between movements on separate axes.

(2) The type and number of vehicles that can be profitably used in any particular jungle operation are dependent upon the available roads and trails, terrain, climate, vegetation, and soil trafficability. An additional, and frequently decisive, factor in considering movement by vehicle is the capability to satisfy convoy security requirements.

(3) Wheeled vehicles are normally restricted to dry weather use of roads and wide trails. For cross-country movement, tracked vehicles may prove suitable provided vegetation and terrain obstacles and soil trafficability permit. Cross-country movement requires reconnaissance, and preselection and marking of routes, with particular attention accorded the selection of suitable river, stream, and canal crossing sites.

d. Inland Waterway. Rivers, streams, and canals provide an economical mode for moving supplies and equipment in jungle operations. In remote areas, inland waterways may very well constitute the backbone of the transport system. Large rivers draining the area may accommodate the passage of small ships and large boats for several hundred miles inland. Where smaller tributary streams branch out, transfer points may be established for the transloading of cargo into smaller watercraft for further movement into the interior. Flooding conditions in smaller streams, while constituting an added hazard may also prove advantageous by permitting the use of deeper draft watercraft and of motors. Movement by military watercraft may be supplemented by

using native craft, preferably operated by indigenous personnel. In emergency, rafts may be constructed for use as an expedient. However, rafts are difficult to control, particularly in swift or turbulent streams. Caution should be exercised in constructing a raft from jungle hardwoods. If the log is of such density that it will not float, the raft will not float.

e. Air.

(1) The nature of jungle operations and the environment within which the operations are carried out; the recurring requirements for rapid and flexible movement of supplies, equipment, and personnel and for evacuation of casualties; and the frequent nonexistence or inadequacy of other movement modes all combine to emphasize the significance of an air line of communications in support of jungle operations. Support may be either by fixed wing aircraft or by helicopter. Both types of aircraft are subject to performance limitations imposed by temperature/density altitude conditions. The operator's manual published for each type of aircraft contains detailed performance capability data for that type of aircraft under specified conditions. (Simply stated, aircraft performance capability decreases as the outside air temperature increases and/or density decreases. Air decreases in density as it becomes warmer.)

(2) Generally, fixed wing transport aircraft can operate at greater radius distances (distances out and back without refueling) than can the transport helicopter. However, use of fixed wing aircraft for air-landed logistic support of jungle operations requires suitable landing strips, normally not found in forward or remote jungle areas. Airfield construction in these areas usually requires the use of heavy equipment, involves the expenditure of significant amounts of manpower and materiel, requires considerable time, and (particularly during the wet season) is accomplished under extremely adverse conditions. Additionally, continuing maintenance is normally required if the air strip is to remain operable. An alternative is to airdrop the supplies and equipment. However, because of the dense jungle canopy and the often impenetrable undergrowth, a high percentage of airdropped supplies may not be found by supported elements or may be recovered by enemy troops.

(3) Helicopters are particularly well suited for movement of supplies and equipment in support of jungle operations. Although more restricted than the fixed wing transport in the ra-

dus distance at which it can operate, the helicopter in airlanded operations requires comparatively little in the way of landing facilities construction. Usually helicopter areas can be constructed by troops or indigenous personnel using handtools, power saws and explosives. Since the helicopter can carry cargo externally, the aircraft may be hovered and the cargo released from, or attached to, the helicopter cargo hook without the aircraft actually landing. If necessary, the helicopter operated at appropriately reduced weight, can be hovered over the jungle canopy or other areas at heights commensurate with the length of the helicopter cargo winch cable length.

f. Rail.

(1) With few exceptions, rail movement capabilities in jungle areas are limited or nonexistent. Except for coastal lines, most serve as feeder lines from a commercial establishment (plantation, mine or factory) to a port.

(2) Track structure is usually light, and track gauge may vary between different areas. The country may be dependent upon import for engines, rolling stock, construction and maintenance equipment, and for fabricated steel items such as rails and structural members for bridge and culverts.

(3) Railroad rights-of-way in the jungle areas are difficult to maintain, particularly during the rainy season. Isolation, vulnerability to sabotage, and the absence of alternate routes may subject rail movement to frequent traffic interruptions.

g. Pipeline. Normally, if pipeline is available in jungle areas, it is comparatively limited and, in most cases, serves only to clear the port by moving POL from the port to storage facilities usually located only a short distance inland.

4-15. Security

a. Security of lines of communication in jungle operations is a continuing problem, critical to successful resupply support of forward elements. Most surface lines of communication are covered by a heavy overhead foliage canopy that interferes with or prevents effective aerial reconnaissance. Heavy undergrowth, particularly along inland waterways, facilitates enemy ambush of surface movements.

b. Continuing route surveillance and reconnaissance of land and water routes is required to locate and eliminate mines, roadblocks, ambushes and damage or destruction of enroute facilities.

Armed escort, surface and/or air, should be given individual vehicles and convoys of land and water movements as required. Where terrain permits, armored elements may be used to escort ground vehicles. Armed guards may ride with rail movements. Armed helicopters can be effectively used as escort, particularly with air movement. Detailed plans of counteraction to specific situations should be developed, rehearsed, and coordinated with escort elements. Plans should include provision for artillery and close air support over the entire route. Effective and reliable communication between all elements of the convoy and supporting security elements are critical to movement security.

Section VI. PERSONNEL MANAGEMENT CONSIDERATIONS AND SERVICES

4-17. General

The unique environment of the jungle presents every commander with added personnel management problems. Extremes of temperature, climate, vegetation growth, terrain features, native cultures, and wildlife make the jungle appear as a natural and formidable foe. In it, the soldier faces the prospects of new and strange circumstances, potentially fatal tropical diseases, heat oppressive humidity, extended periods of silence, semidarkness, or total darkness, unfamiliar sights, smells, and sounds, strange natives, presence of wild beasts, difficulty of movement under the best of conditions, periodic isolation from support elements which bring him mail, pay and entertainment, and constant threat of enemy ambush and close-quarters combat. These factors will have a direct bearing on his ability to properly react to his leadership and his desire to consistently perform at peak efficiency. Commanders should recognize the requirement for acclimatization and psychological adjustment of all personnel, especially individual replacements (see chap 6) and insure that all personnel receive a complete orientation of the unit, its mission, and the routines of jungle living, working, and fighting. To the extent practicable, all men should be kept informed of the overall situation since it is seldom possible for a man to observe the actions of adjacent units or even individuals. Each man must realize his part in the overall operation if his maximum effectiveness is to be gained. Each individual, particularly newly arrived replacements, should be furnished a reasonable period of time to make a satisfactory initial adjustment to

4-16. Movements

For maximum efficiency, all modes available for use in a line of communications should be considered for incorporation into an integrated rapid transport system appropriate to the operational requirements. To assure necessary integration and coordination, the system must operate under centralized control. This control is exercised by a movements control center assigned to the supporting logistical headquarters. For division operations, the division transportation office and movements control sections at each brigade control movements throughout the division. For a detailed discussion, see FM 55-10.

the jungle environment. Efforts should be made to promote the buddy system, closeknit team or small-group relationships. Such relationships will help preclude self isolation, combat periods of extreme loneliness, and should assist in the identification at an early time of symptoms of individual or unit inability to successfully cope with the jungle environment.

4-18. Personnel and Administrative Services

a. General. P&A Services function essentially the same as in more conventional environments; however, the manner in which they are furnished depends upon available transportation and the location of supported units. Complete personnel, administrative, replacement and postal services (FM 12-2), and finance (FM 14-3), normally will be available at base camps, and projected as required to supported units by the use of small contact teams. Special Services can be expected to be minimal in the jungle and will consist mainly of the individual and small group recreational pursuits. Replacements and mail will, in the majority of cases, be delivered by air (probably helicopter) to those units which are isolated from main water, airstrip, or road thoroughfares. On occasion, the weather, terrain features of a particular locality in the jungle, or prevalent battle conditions may temporarily delay delivery of mail or replacements; these instances should be of very short duration and should not develop into criticalities which will affect the supported unit's capability to perform its mission.

b. Personnel Liaison and Status Reporting. Commanders should assure themselves that effective

tive liaison and communications exist between their supported units and the source of P&A Services and that their assigned personnel who are charged with P&A actions and liaison responsibilities understand and appreciate the need for expeditious, accurate, and timely personnel status reporting to P&A direct support elements.

c. Military Pay. Commanders should impress upon their men before an operation begins that there is little or no need for money in the jungle and encourage them to participate in programs which provide for pay deposits in the Uniformed Savings Deposits Program, transmittal of net pay to a bank or authorized savings institution by check from the servicing finance office, or accrual of pay at the finance office for withdrawal by the member at a future date. Particular emphasis should be placed on the advantages to the member of discharging his financial responsibilities through pay allotments.

4-19. Graves Registration

Direct support for the recovery, identification

and evacuation of deceased personnel will normally be available to the commander in the jungle environment. All echelons of command should emphasize the importance of expeditious removal of remains in the interests of troop morale, to prevent loss, excessive deterioration, or mutilation of remains in the jungle, and to maintain our nation's confidence in the uniformed services' methods of handling their dead. The hot and humid climate, presence of wild animals, birds, insects, natives and the dense vegetation and poor visibility on the jungle floor all present special problems. If hasty burials are authorized and implemented as a last resort when means of evacuation or preservation of remains are not available to the commander, care must be exercised to conspicuously mark grave sites to enable their relocation. Rapid growth of vegetation, heavy rains, and other natural factors tend to alter the appearance of jungle terrain over short periods of time and recovery of remains from hasty burial sites can be expected to be difficult under the best of circumstances.



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CHAPTER 5

JUNGLE OPERATIONS

Section I. GENERAL CONSIDERATIONS

5-1. General

Standard and current combat principles must be applied to a jungle environment with emphasis placed on the modification to those principles that are necessitated by the environment. Jungle operations are characterized by restricted maneuver, slow tempo of operations, close combat under conditions of extremely limited visibility, and difficulty in providing logistical support. Special operations, such as patrolling actions, operations from forward positions, ambush, and other forms of close combat are common in jungle areas.

5-2. Factors Affecting Employment

a. Mission. Because of the difficulties of command, control and communications, jungle operations require centralized planning and decentralized execution. Commanders must use mission type orders that give maximum latitude to subordinates. It is essential that the mission be understood by all personnel.

b. Enemy. The commander will require timely and accurate information on enemy location, strength, disposition, composition, and activities so that he may make a continuing estimate of enemy capabilities and vulnerabilities. In the collection effort, extensive patrolling action will be necessary due to the limitation of other sources normally available. Poor observation from both ground and air will make it difficult to determine enemy locations and strength. Commanders and intelligence officers must be cautious not to conclude that the enemy cannot attack through supposedly impenetrable areas or that he cannot reinforce in time to affect the mission. Movement from friendly positions to an objective may take longer than estimated, and the enemy may take advantage of this to reinforce with a unit initially considered too far away to be used logically for that purpose. An enemy capability of employing airborne or air mobile forces must be considered by the commander.

c. Terrain and Weather.

(1) Terrain.

(a) Key terrain. Key terrain in jungle areas includes trails (fig. 5-1), roads (fig. 5-2), bridges, streambeds, and communications centers. High ground is still selected as key terrain but for varying reasons. A hill may be the only feature in the area which affords a suitable area for defense. A river through an otherwise impenetrable forest may be a key terrain feature (fig. 5-3). A helicopter landing zone could also fall into this category.

(b) Observation and fields of fire. In dense jungle, observation and field of fire are limited by the undergrowth. In the rain forests, however, although good observation into the forest from the outside or above may be nonexistent, it is possible to have fair observation and good fields of fire for a reasonable distance at ground level (fig. 5-4). This condition exists where the branches of tall trees interlace to form a canopy through which few sunrays penetrate, thereby prohibiting the growth of grass, bushes, or other foliage. Where old forests have burned or have been destroyed, the resulting tangle of secondary growth seriously limits both observation and fields of fire. In open areas observation and fields of fire may be limited by the height of the jungle grass, which sometimes grows several feet over a man's head.

(c) Cover and concealment. Dense foliage affords excellent concealment from the ground and air observation (fig. 5-5). Cover is provided by surface irregularities such as ravines and gullies. In certain jungle areas the presence of extensive ground level roots will make digging very difficult, requiring the construction of positions above ground level.

(d) Obstacles. Many natural obstacles exist within the various types of jungle areas. In the older forests there is generally no obstacle to foot movement other than incidental swampy areas, occasional fallen trees, vines (fig. 5-6),



Figure 5-1. Jungle trail.



Figure 5-2. Jungle road.

and extensive ground level roots (fig. 5-7). However, the trees themselves, depending on their spacing and the moist ground, act as obstacles to vehicular movement. Manmade obstacles are often more effective in jungle areas than in normal terrain, due to limited communication routes. A log barrier across a trail or nuisance mining along the road may cause a marked increase in the delay to the opposing force and may require a greater amount of effort for its removal or the preparation of a bypass.

(e) *Avenues of approach.* Suitable routes, considering the aspects of good observations, field of fire, use of key terrain, cover, and avoiding obstacles, may be virtually impossible to find. A

compromise must be made because of the limited existing routes. Cutting of new trails and repair of those already in existence are constant tasks. In selection of avenues of approach available to the enemy, the commander and the Intelligence Officer should not consider any portion of the jungle area to be impassable, no matter how difficult or thick.

(f) *References.* Also see paragraphs 6-4 through 6-10 for discussions on the above.

(2) *Weather.*

(a) Weather forecasts will be generally reliable in jungle areas due to the more apparent divisions between the two predominant seasons—dry and rainy—except in certain areas where



Figure 5-3. Jungle river.

there are no dry seasons. During rainy seasons rainfall can be predicted with reasonable accuracy. The volume of rainfall is the most important factor. Two hundred inches of rain are not uncommon in a year; during dry seasons, it is not unusual for two or more months to pass with no precipitation whatsoever.

(b) Visibility may be greatly restricted during rainy seasons due not only to the rainfall itself, but also to heavy ground fogs which may linger for several hours after sunrise. Light data which could be used in drier climates is of less value under such circumstances.

(c) Absence of wind in areas of dense jungle or undergrowth will have a marked effect on the employment of smoke. High winds may not be felt in heavily vegetated areas since they tend to pass above the jungle canopy.

(d) Temperature changes in mountainous

jungle areas will sometimes range 40 to 50 degrees over a period of 12 hours. In other jungle areas the deviation from day to night will be constant and have very little change.

(e) Trafficability varies with the location of the jungle area. Near large bodies of water, low ground may be constantly soft, even in the dry season and may, therefore, be passable without improvement only to foot troops. Conversely, at higher elevations, trafficability may remain excellent throughout most of the year, becoming poor only during the worst part of the rainy season. At times, even when trafficability has been excellent, the volume of rainfall within an hour or less may completely halt vehicular movement and severely restrict foot movement.

d. Troops Available.

(1) No realistic plans can be made or ac-



Figure 5-4. Visibility in rainforest.

tions taken that do not consider the capabilities of the forces available.

(2) The capabilities of a force are dependent on:

- (a) Number of units.
- (b) Type of units.
- (c) State of training.
- (d) Morale.
- (e) Strength in men and equipment.
- (f) Previous, present and contemplated employment.
- (g) Location and disposition.
- (h) State of maintenance and supply.
- (i) Adequacy of combat support and combat service support.
- (j) Experience of commanders.

5-3. Operational Limitations

In jungle warfare, forces may have to move rapidly from primary jungle through secondary growth to cultivated areas. This requires great flexibility in thought, planning, organization, equipment, and tactics; it may require decentralization of command and control for at times a unit may be located where control is easy; on other occasions, small unit leaders may find themselves operating on their own initiative for long periods.

The possibility of sudden enemy air or ground attack at any time must not be overlooked. The unit fighting in jungle has to operate within its own resources more often than in any other type of terrain. The jungle unit must be so balanced that it is capable of developing at any time an effective degree of mobility and firepower without support from higher echelons. This ability will largely be dependent upon the factors of communication, maintenance and discipline. The effects of the restrictions imposed by jungle on operations are—

- a. Forces should move on separated axes.
- b. The amount of heavy equipment and supporting weapons that can be used is severely limited.
- c. Control is difficult and must be decentralized.
- d. Frontages must be shortened and intervals must be lessened in movement.
- e. Numerous limited objectives must be assigned in an attack.
- f. Maintaining direction of movement is difficult.
- g. Silence and security measures increase in importance.



Figure 5-5. Uncamouflaged soldier at a distance of 5 feet.

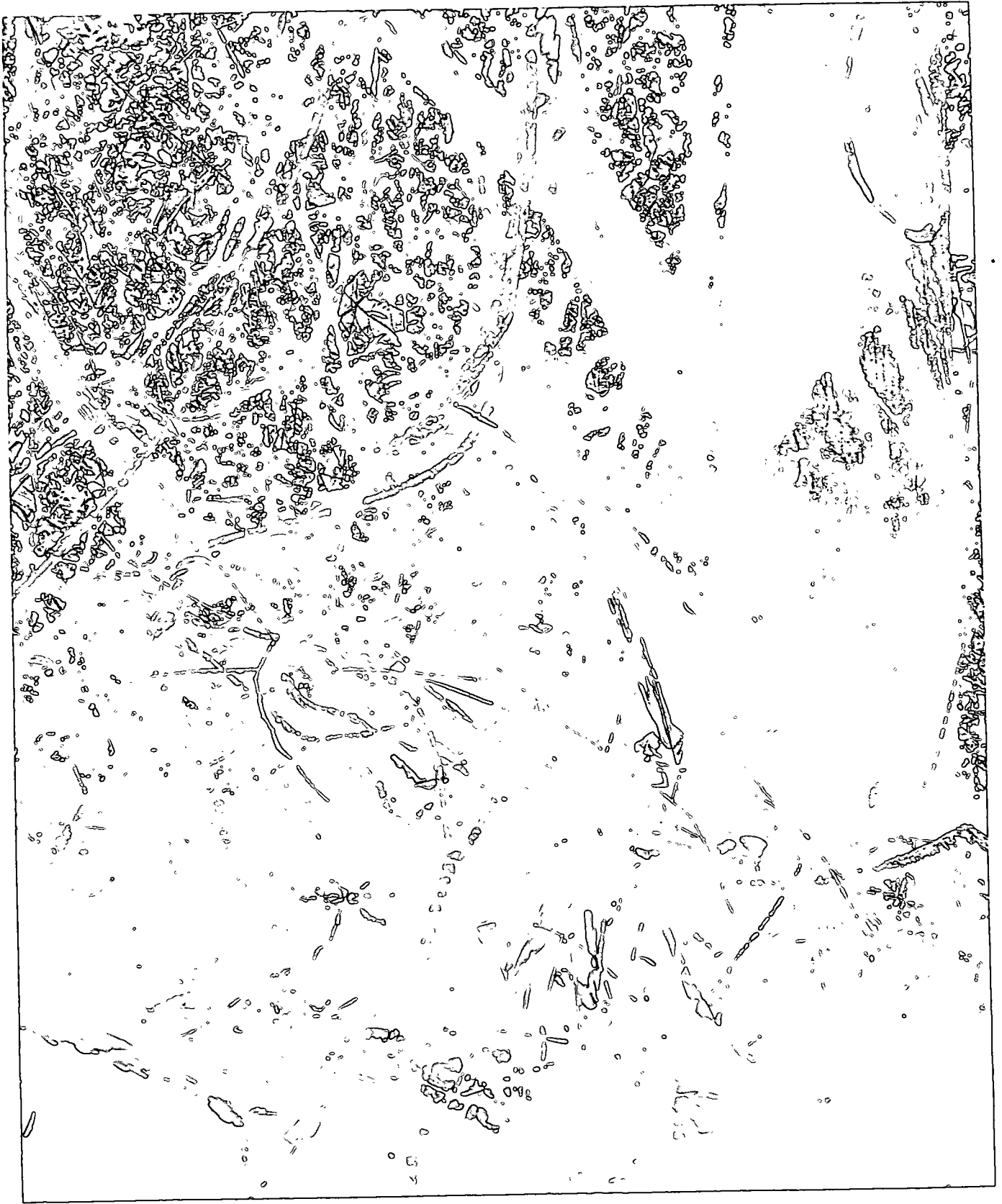


Figure 5-6. Vine entanglement in rain forest.



Figure 5-7. Typical root formations found in rain forest.

5-4. Preparation for Combat

For jungle operations, a detailed standing operating procedure (SOP) and rehearsed battle drills should be prepared by all units down to and including fire teams. This SOP may include organization for combat, supply procedures, bivouac

and shelter preparations, march rate, and formations. The battle drills should provide for action to be taken in the event of sudden enemy contact, occupation of patrol bases, defensive positions, and silent communications.

Section II. RECONNAISSANCE, SURVEILLANCE AND SECURITY OPERATIONS

5-5. Reconnaissance

a. General. Reconnaissance operations take on added importance in jungle warfare. Many offensive operations in the jungle take on aspects of a reconnaissance operation during movement to contact. Extensive patrolling will be required to obtain information on enemy locations, strength

and disposition. The success of offensive operations designed to destroy the enemy depends upon being able to find him. The excellent concealment found in the jungle enables the enemy to construct well concealed positions and often enables him to move largely unobserved, both day and night. Although the primary objective of recon-

naissance in jungle operations is to locate and to obtain information of the enemy; the enemy's resources and terrain features may be assigned as secondary objectives. Reconnaissance is a continuing responsibility of each commander and soldier. All units have reconnaissance capabilities and responsibilities which may be limited to short patrols during conduct of normal mission activities, or may extend to offensive operations involving specific reconnaissance tasks.

b. Planning Control, and Coordination of Reconnaissance Activities. Reconnaissance planning in jungle operations must be thorough and provide for detailed control and coordination. Reconnaissance must be coordinated at all levels of command to insure maximum results from the intelligence effort, prevent duplication of effort, and provide for economical use of reconnaissance forces. Commanders conducting the reconnaissance will use radio as the primary means of control. When contact is made with an enemy force in the jungle, the situation must be developed as quickly as possible and the information relayed to the controlling headquarters immediately.

c. Ground Reconnaissance. Ground reconnaissance means in jungle operations consist of observation posts and short and long range reconnaissance patrols. The value of observation posts will be limited due to visibility limitations in the jungle. Observation posts established along trails, roads and streams are a source of valuable information on enemy movement. Reconnaissance patrols in the jungle ideally consist of six men or less moving by stealth, taking advantage of natural concealment, and avoiding any engagement with the enemy. The depth at which these patrols can operate in enemy areas is increased by the use of helicopters and other transportation means to deliver and retrieve them. For further details on reconnaissance patrols, see paragraph 5-24.

d. Air Reconnaissance. Visual observation from the air can be used to locate the enemy in those areas where gaps exist in the jungle canopy and to identify prominent terrain features. Aerial photographs are a prime source of information on terrain and enemy installations and activities. Detailed photo interpretation can disclose hidden enemy positions and camps not visible to the air observer. These photographs can also be used as a means of locating suitable helicopter landing zones for friendly forces. Deceptive air reconnaissance must be practiced during such flights so that enemy forces are not warned of impending actions.

e. Other Reconnaissance Actions.

(1) *Reconnaissance in force.* Principles and techniques of this type of reconnaissance are often applied in jungle operations. One distinct characteristic of reconnaissance in force in the jungle is the development of more and smaller maneuver elements than is characteristic of such operations in nonjungle areas.

(2) *Reconnaissance by fire.* This type of reconnaissance is made at the risk of losing surprise in jungle operations. It may be used effectively to determine the flanks or gaps in enemy lines. Reconnaissance by fire from armed attack helicopters on suspect areas is an effective means of locating well-concealed enemy troops. Reconnaissance by fire may also be employed effectively by tracked vehicles moving across country and by all vehicles in march column along jungle roads. Such fires will aid in the early identification of enemy strong points and ambush locations and will help prevent surprise and close-in attack by the enemy. When using reconnaissance by fire, consideration must be given to the large quantities of ammunition expended and the difficulties of resupply.

5-6. Surveillance Operations

a. General. Surveillance operations in the jungle encompass all techniques of accomplishing a continuous systematic watch over general jungle areas as well as selected areas such as trails, streams, and jungle clearings to detect the presence or absence of the enemy. They are usually carried out to support other missions or forces. When planning surveillance operations, the factors of METT will govern the organization and disposition of forces.

b. Ground Surveillance. Employment of ground surveillance devices in jungles is limited to those areas where vegetation and terrain do not restrict line-of-sight. The complexity of terrain and the environment make it difficult to displace and move electronic sensors in time to be responsive to immediate requirements. High temperatures and high humidity have an adverse effect on the life of the power source for these devices.

(1) Short range ground surveillance radars, night observation devices, and unattended ground sensors can provide information on enemy movement, estimated size, direction, and rate of movement. The radar and unattended ground sensors are equally effective day and night while the night observation devices operate only during darkness.

(2) The many ways that the unattended ground sensors can be emplaced and used to gain information about the enemy activity make them a valuable asset in the jungle.

c. Air Surveillance.

(1) Visual air surveillance may be conducted from helicopters and fixed wing aircraft. Pilots and observers should be completely familiar with ground activity in their areas of responsibility in order to recognize any deviation from normal patterns. Systematic coverage by the same personnel will assist in revealing unusual activity. These personnel can also locate and report likely landing zones in fast moving situations for employment of airmobile forces.

(2) *Aerial photography.* Periodic photo coverage of an area can be used to supplement visual air surveillance. For further details on the employment of aerial photographs, refer to FM 30-20.

(3) *Side-looking airborne radar (SLAR).* Penetration of the foliage with radar emission from an aerial platform is limited; however, SLAR can be used effectively during the day, at night, or during periods of poor visibility. It can discover location and movement of enemy watercraft along jungle coasts and on rivers, enemy vehicles on roads, and railways. It will also locate savannas and discover any vehicular movement therein.

(4) *Infrared detection devices.* These devices can assist in detecting signs of enemy troop concentrations and stockpiles of supplies. The effectiveness of these devices is reduced by fog, clouds, vegetation and precipitation. See FM 30-20 for details.

(5) *Airborne personnel detector devices (sniffers).* These devices are valuable in locating human habitation under the jungle canopy. They detect products of human metabolism in the air. The effectiveness of these devices is reduced by fog, precipitation and windy conditions.

(6) *Supporting services.* Air Force reconnaissance wings can provide additional surveillance information such as night photographic, radar photographic and weather information. Naval and Marine air can provide similar support and may be primary sources when Army

units are engaged in riverine operations or amphibious operations along jungle coasts.

5-7. Security Operations

a. General. The fundamentals of security operations are contained in FM 7-20, FM 17-1 and FM 61-100. Large scale security missions such as a corps covering force are not normally required in jungle operations because of the nature of the terrain and the relatively small size of units employed in these operations. Normally, subordinate commanders command their own covering forces.

b. Security Forces. Security in jungle combat operations consists of covering force, advance guard, flank guard, rear guard, and screening missions. Operations will be slower in the jungle and the distance between security forces and the force being secured are reduced. Security measures are intensified because of reduced observation, difficulties of control, communications, and movement. If a unit is operating independently, all-round security is essential. In dense growth, flank security forces must cut their own trails and often cannot maintain a uniform rate of speed. They must be rotated frequently to avoid fatigue and a letdown in alertness. The security obtained from friendly units located on the flanks must be analyzed thoroughly as small gaps can provide infiltration routes for the enemy. The perimeter defense (discussed in para 5-17-5-19) should be organized by isolated units and by support units located in rear areas as the jungle affords the enemy many opportunities for infiltration and attack from any direction.

c. Security of Lines of Communication. Lines of communication such as roads, passable trails and waterways are critical to jungle operations as well as the economies of civil population and must be secured. Securing lines of communication involves: route surveillance to discover and eliminate mines, other barriers to movement, and ambushes; security of bridges to prevent destruction by infiltrators or guerrillas; and actions outlined in paragraph 106, FM 17-1. Clearing of the vegetation along routes will assist in the elimination of ambushes and will enhance surveillance. Security of waterways normally is assigned to the Navy; however, at times it may be necessary for Army units to perform this mission.

Section III. OFFENSE

5-8. General

a. Concept. Units conducting offensive operations will have to be organized for combat to

make the best use of the capabilities of all its elements. The principles of offensive combat apply to a jungle environment, however, certain modifi-

cations will be required depending on the area. Jungle operations lack the unity characteristic of offensive combat in more open terrain and operations become a series of small decentralized and often independent unit engagements. Security elements are essential to prevent surprise and to protect the command. Jungle areas are conducive to surprise attacks, ambush, infiltration and guerrilla warfare.

b. Fundamentals of Offensive Action.

(1) In the offense, combat power is attained by forming responsive combined arms forces capable of moving rapidly in jungle terrain without loss of ability to deliver accurate fire and maintain continuous communications.

(2) The restricted horizontal and vertical visibility requires the use of all means, including extensive reconnaissance and security actions, to locate the enemy. Once located the enemy must be quickly and decisively engaged since contact is difficult to maintain.

(3) Information concerning the enemy and his capabilities is difficult to obtain in jungle areas. In all offensive actions commanders must take immediate action to determine the strength and location of the enemy's main position to prevent premature deployment of the main body.

(4) Because of the lack of adequate routes of communication, the few existing helicopter landing zones, roads, and trails are critical to jungle combat. Commanders must secure and control such features and deny their use to the enemy.

(5) The configuration of the terrain with its accompanying heavy vegetation will require close coordination between fire, fire support, and maneuver elements to create a preponderance of combat power and insure the momentum of the attack.

(6) Jungle combat requires a reserve to generate additional combat power to exploit success and to insure complete destruction of an enemy in retreat.

c. Forms of Maneuver. The initial consideration in a maneuver tactic is that the plan must be simple and that the maneuver element does not mask the fire of the support element. Forms of offensive maneuver in the jungle are normally restricted to envelopments and frontal attacks. Envelopments are executed, where possible, in conjunction with frontal attacks. Airmobile forces are useful in executing envelopments in the form of surprise attacks, flanking maneuver, and in blocking enemy routes of withdrawal. Infiltration tactics and techniques take on increased em-

phasis for opposing forces because of the visibility restrictions imposed by jungle vegetation. For further tactical considerations in ground and airmobile maneuver, see FM 7-11, FM 7-20, and FM 100-5.

d. Objectives. Key terrain features in jungle include high ground, roads, trails, navigable waterways, communication centers, and landing zones. These features may be assigned as objectives in order to deny their use to the enemy. The importance of high ground as a terrain objective is reduced by restrictions on observation and fields of fire except where jungles border cultivated areas or grasslands. Since jungle operations are characterized by limited capability to resupply the force, enemy bases of supply and operations are profitable objectives. The enemy force itself will always be considered an objective in jungle operations.

5-9. Planning the Attack

a. General. The plan of attack includes the scheme of maneuver and plan for fire support; simplicity of plan is the essence of a successful jungle operation. Such planning must provide for continuous effective control by the commander. Because of the difficulty in obtaining information on the enemy, planning for an attack may occupy days; however, in many instances the commander will have only a few hours or minutes to plan and launch his attack. For this reason, units must maintain a current SOP to include rehearsed battle drills to cover main contingencies. For detailed coverage of planning in offensive combat, see FM 7-11, FM 7-20, and FM 61-100.

b. Scheme of Maneuver. The detailed planning for placement and movement of the maneuvering force is based upon the factors of METT and emphasis is placed on the use of measures to insure maximum control. Close combat conditions in the jungle require that during an attack the commander be positioned where he has the maximum opportunity to control the course of the battle. He must relate his observations and available information to the maneuver and he must be prepared to modify his scheme of maneuver based on enemy reaction.

c. Organization for Combat. Organization for jungle combat combines adequate forces to accomplish the mission and facilitates command and control of these forces. In most jungle areas the vegetation will be dense and trafficability poor, necessitating the employment of dismounted and lightly equipped infantry units. Savanna

grass and some tropical rain forest and secondary growth forest areas will be suited for combined arms forces. Airmobile or airborne forces can be used effectively when adequate landing areas and drop zones are available. The combat force must be well balanced and be able to accomplish the mission with a minimum of additional support. Reserve forces must be capable of rapid deployment.

d. Plan of Fire Support. Fire support is as essential in the jungle as in open terrain. Fire support plans must be developed in consonance with scheme of maneuver. This plan must provide for the coordination of all available fire support agencies to include tactical air, naval gunfire, and armed helicopters. Maximum use should be made of Army and Air Force aerial fire support when available. Because of the isolated nature of jungle combat, commanders at the lowest echelons must be aware of the overall fire support plan and be capable of calling for and directing artillery, tactical air, naval gunfire, and armed helicopters.

e. Control and Coordination. Control of an attack in jungle depends upon the commander and his subordinate leaders having current information about the progress of the attack and having efficient means to pass information on to all concerned. The commander increases his control of the situation by positioning himself so he can observe the action, if the terrain permits. Communications are the key to command control in the jungle attack. Good communications can be facilitated by establishing a headquarters on a reduced scale well forward before the attack starts. This headquarters should be sited in an inconspicuous position which favors radio equipment and affords a suitable command post close at hand. The commander should leave this CP only during the active phase of the battle when he considers that his presence will directly influence the outcome of the attack, or when he can best control from an aerial CP above the battle area. In close jungle where control is adversely affected, he must position himself where he can best influence the action and where he can quickly move to the area affected. In areas where the vegetation permits, smoke can be used effectively to mark the flanks and position of friendly forces.

5-10. Movement to Contact

a. General. The movement to contact is often restricted unless trails are cut. Flank protection for moving columns is difficult and security forces work at greatly reduced distances. The

rate of march is governed by the nature of the terrain and vegetation. In the jungle, time factors will be increased and space factors decreased. The commander places himself and his supporting weapons well forward. When the position of the enemy has been determined and contact is imminent, the final stage of the movement is made. The advance is by bounds, from one terrain feature to another, maintaining visual contact between bounding elements. Line formations are rarely used by leading elements until contact is made.

b. Planning. Detailed planning should consider:

(1) The configuration of the ground and type of vegetation.

(2) Likely ambush sites. Long and especially steep, straight stretches of trail networks, bends in trails particularly on crests, small open areas, creek and river crossings, timber edges, trails cut or worn into hillsides and grassland growths should be carefully marked on the map and considered as danger areas.

(3) Likely enemy outpost or observation positions. Knolls, the ends of ridge lines along which the axis of advance passes, variations in the vegetation patterns which provide good fields of fire to the enemy, and trail junctions should be avoided or carefully reconnoitered prior to crossing.

(4) Any marked variation in terrain or vegetation likely to require a change in formation, such as the transition from jungle to village areas, swamps, grasslands, and cultivations should be identified and plans formulated accordingly.

(5) Possible positions for indirect fire weapons.

c. Formations. The vegetation found in primary jungle or secondary growth often forces the unit to advance in the file formation. Whenever possible, however, the unit should move in multiple columns even if the columns are forced to advance in file. Such a platoon or company formation is more difficult to control under these circumstances, and they may require greater than normal time to deploy. In order to speed up deployment from file or multiple columns in close jungle country, units should develop and rehearse SOP's and immediate action responses. If a squad is used as the point during the advance, distances between men may average five to seven paces but troops must retain visual contact. If a platoon is used, this same spacing should be continued throughout the platoon so that the overall length of the point platoon approximates 250 meters in length. The main body may use one or both sides

of the path made by the point and the interval between men should be reduced to three paces. If the main body is the remainder of a company, its overall length would be approximately 400 to 500 meters. Such a formation is suitable for movement through dense jungle. In plantations with regular rows of trees it would be vulnerable to machinegun fire. On passing into paddy fields, villages and open swamps, the formation should be opened up as enemy observation is increased. The commander of the point should receive instructions as to the method of dealing with any unexpected changes of topography, i.e., whether to bypass the area and then search back, or whether to alter the formation and pass through.

d. Security. See paragraph 5-7 and FM 7-20, FM 17-1, and FM 61-100. For brief halts local security is obtained by having troops face outwards from the path of movement and by taking up firing positions just away from it. For longer halts, as at meal times, squads and platoons should form an all-round defense and security elements should be employed. Security measures should be standard battle drill and executed without orders during halts.

5-11. Meeting Engagements

a. General. Meeting engagements will occur frequently in jungle areas because of varying densities of vegetation which restrict visibility and muffle sounds of movement. The principal characteristics of jungle meeting engagements are a minimum of time for the commander to develop the situation and a requirement for rapid formulation and execution of plans.

b. Conduct of Meeting Engagements.

(1) In a meeting engagement the commander who first estimates the situation, arrives at a decision, issues his orders and executes his plan, enhances his chances of success. By rapidity of action, he seizes the initiative and gains surprise. The nature of the engagement coupled with limited observation will require the commander to base his estimate and decision on very limited information.

(2) The following features common to meeting engagements should be noted:

(a) There is no stage of development of the column. The troops move from route column to assault positions.

(b) Supporting fires are delivered on the enemy immediately upon contact and attempt to gain fire superiority while the friendly forces deploy.

(c) The enveloping force must move rapidly but must arrive at the assault position in physical condition to enter the fire fight.

(d) If aerial fire support is to be used, the leader of the enveloping force must know it, and the pilots must be carefully instructed as to the areas, times and direction in which they are to make bombing and strafing runs.

(e) When supporting fires are used, they are lifted or shifted by the commander of the enveloping forces.

(f) Reserve elements protect the rear and defend against enemy counterenvelopments. If not required for such purposes, the reserve elements may be used to exploit a success or extend an envelopment, but they should always be held out initially until the situation is clear.

5-12. Conduct of the Attack

Based on information obtained by reconnaissance and other sources, the commander decides on the direction of attack. The attack is conducted with a formation similar to that used in a night attack in open country. Distance and intervals are reduced and the column formation is maintained as far forward as possible. Fire support is as essential in the jungle as in open terrain; unsupported infantry ordinarily cannot breach a defensive position without incurring heavy casualties. The area to be breached must be pinpointed. Artillery and mortar forward observers may have to approach within extremely short range of their own fires. During the assault, supporting fires should continue until they are lifted or shifted by the assaulting commander. They are then shifted to cover the specific targets that will most assist the progress of the assaulting force and block probable withdrawal routes of the enemy. Because of terrain and visibility restriction, an assault line, as such, is not normally formed. Rather, aggressive fire and movement by assaulting fire teams are conducted to overcome enemy resistance. Due to the difficulty in locating enemy emplacements by visual means alone, the fire and movement phase of the assault may force the enemy to disclose his position. As enemy emplacements are located, the assaulting force generally moves on a single axis with the fire concentrated on a selected and limited area of the enemy defensive perimeter. Smoke may be used to screen off the flanks of the area of the enemy defensive perimeter. Smoke may be used to screen off the flanks of the area selected for penetration. The objective of the initial assault is to achieve a local penetration

into the main battle position of the enemy. Once the penetration is made, it is exploited until the objective is taken. After the objective is overrun, it must be secured immediately with a hasty perimeter, security measures set up and preparations made to repel an enemy counterattack or to pursue residual enemy forces.

5-13. Infiltration

a. Jungle areas are ideally suited to infiltration. Dense vegetation and unusual landforms will limit the enemy's observation and his ability to detect movement. As a technique of movement through enemy positions, infiltration may be used in conjunction with offensive maneuver in the jungle. Although jungle infiltrations are usually dismounted, under certain circumstances aircraft and watercraft can be used effectively to expedite movement.

b. An infiltration prior to an attack is difficult to coordinate and control. Planning must be detailed and troops must be carefully briefed. Roads, trails and waterways will normally be under enemy surveillance and caution should be exercised when using these as infiltration routes. Movement by stealth through dense jungle will be extremely slow and exhausting. Adequate communications must be provided in order to check the progress of the operation and to coordinate fires with the movement. For further tactical considerations of infiltration see FM 61-100.

5-14. Exploitation and Pursuit

a. Exploitation. Each local success should be exploited immediately and vigorously by reserve elements to cut off the retreat of isolated enemy forces. Airmobile troops can be used effectively to block retreat by employment along probable escape routes as well as to cause harassment and disruption of enemy reserve and supply areas. Artillery should provide fire support to cover escape avenues. Helicopters may be employed to shift artillery weapons and forward observers rapidly, without regard to terrain obstacles, and, if armed, to attack withdrawing enemy forces. Tanks may be utilized along trails, roads, and less dense jungle areas to attack and/or block retreating enemy forces. Tactical air support, if available, should be called upon to attack retreating forces. Helicopter gunships may also be employed. During exploitation, the security of rear areas must be assured against actions of bypassed enemy groups.

b. Pursuit. In pursuit of defeated enemy forces the commander may be expected to run many more risks than would ordinarily be tolerated. Success in jungle pursuit is dependent on maintaining contact, either physically or by short distances. Extra precautions, which must be taken to avoid moving into an ambush, can slow pursuit operations considerably. Normally the fatigue of the attacking troops will exceed that of the defender. For this reason it is better to employ reserves in the pursuit instead of the troops of the attacking echelon.

5-15. Night Combat

a. General. Night fighting in the jungle is extremely difficult; troops must be conditioned to the fact that it is not impossible, but on the contrary, quite probable. In jungle where there is a canopy, night brings complete darkness to the ground. This condition forces the soldier to use his senses of smell, hearing and touch to a high degree. Troops, as a consequence, should receive intensified night training conducted either in jungle terrain or in dense woods. The soldier should be made aware that thick vegetation and heavy rain slow movement, and increase the difficulties of maintaining contact with groups. All of these factors should be related to the problems normally associated with night operations in any type of terrain.

b. Night Movement and Maintaining Contact. During-the-night movement in the jungle is most successful when confined to established trails and roads. It must be remembered, however, that such trails and roads are potential killing grounds for enemy ambushes. Groups using these routes must be prepared for immediate action. If it is not possible or feasible to use these routes, troops should be prepared to move cross-country. This movement will be slow, arduous, and exhausting. Extensive night movement is not practical, especially for sizable units. The problem of control and maintaining contact will be difficult and will require thorough planning.

c. Night Fighting Techniques. For a detailed account and description of the techniques of night fighting, see FM 21-50 and FM 21-75.

5-16. Coordinated Attack Against a Fortified Position

a. When attacking a fortified position, man-made obstacles such as heavy bunkers, protective and tactical wire, and mines will be encountered.

The enemy will have to be burned or blasted out of his positions. This will require a great amount of firepower and frontages must be narrowed to insure the concentration of these fires. Limited objectives must also be established to facilitate control.

b. Heavily fortified enemy defenses in dense jungle are often so well concealed that their presence is not known until physically encountered by friendly forces at close range. In this situation, use will not have been made of preparatory fires to soften enemy defensive positions as is normal. The use of massive supporting fires at this time usually is necessary to defeat the enemy and destroy his position without suffering undue friendly casualties. Once such type defenses are encountered, the commander may on occasion have to adjust his forward disposition, while still maintaining contact, in order to permit extensive employment of tactical air and artillery fires. Simultaneously, additional maneuver forces are committed to block the enemy's possible withdrawal. Once the preparatory fires have been completed, forces are maneuvered to defeat him in detail.

c. The preparatory phase of such attacks will involve the construction and improvement of roads and trails behind friendly lines to permit

the movement of supplies, ammunition and the weapons that are to be used to support the attack. Predesignated landing zones or drop zones for aerial resupply must also be considered.

d. If naval gunfire can be used to advantage, it should be requested and a schedule of the fires planned in advance. A naval gunfire liaison team may assist in directing the gunfire by direct ship-to-shore communications.

e. Arrangements should be made for maximum artillery preparation and continuing artillery support. The artillery will require adequate time for displacement to new and better positions and registration.

f. Forward air controllers perform ground reconnaissance, employing all possible means to locate accurately the targets for preparatory bombing and strafing attacks.

g. The procurement of combat intelligence by means of airphoto and electronic reconnaissance, interrogation of prisoners and ground reconnaissance patrolling is essential.

h. Combat patrolling must be continuous and aggressive, keeping the enemy on the defensive and limiting his ability to patrol.

i. For detailed characteristics of fortified areas and techniques of combat therein see FM 31-50.

Section IV. DEFENSE

5-17. General Considerations

a. *General.* Defensive combat in jungle terrain does not differ greatly from combat in other types of terrain. The basic principles remain valid; however, the techniques used to apply them vary depending on the nature of the terrain. See FM 7-15, FM 7-20, FM 7-30, FM 61-100 and FM 100-5 for principles, fundamentals and doctrine governing defensive combat.

b. *Fundamentals of Defense in a Jungle Environment.*

(1) Commanders at all levels must make a thorough terrain analysis of any jungle area they are to defend in order to take maximum advantage of its unique characteristics.

(2) Extensive use of security measures will be necessary to prevent surprise. Security elements will be hindered by the reduced visibility and adaptability of electronic sensors in dense jungle areas. To counter this security limitation, thorough and continuous ground reconnaissance is necessary along with the employment of a greater than normal portion of the defense force in the security mission.

(3) Enemy penetrations of friendly defensive positions occur more readily in jungle terrain since it is extremely difficult to cover ground with men, observation, and fire. Consequently, the principle of all-round defense becomes more important than ever. Defense in depth will help achieve good all-round defense.

(4) Short fields of fire and heavy vegetation require that defensive positions be closely linked for mutual support. Adequate support fire with centralized control must be provided to assist in breaking up enemy assaults, to destroy enemy reserves, to hamper or prevent reinforcements, and to provide combat coverage by fire of the entire defensive area.

(5) In order to counter the enemy's attack and to seize the initiative, the commander must make provisions for a reserve. The counterattack is critical to the success of jungle defense.

(6) The use of artificial obstacles and barriers must be considered in conjunction with natural obstacles located around the defensive position.

c. *Forms of Defense.* The two basic forms of

defense, the mobile defense and the area defense, are not usually suited in their classic form, to defensive operations in the jungle. Variations in defense incorporating applicable portions of each will have to be devised based upon a consideration of the factors of METT. Units will frequently have to conduct defensive operations on an isolated basis which will require an all-round form of defense. The perimeter type defense will most frequently be employed; however, it is highly desirable to organize in depth when the terrain permits it and to retain a reserve. In suitable areas the availability of helicopters will enable commanders to conduct mobile defense operations.

5-18. Planning the Defense

a. General. The plan is developed from a detailed reconnaissance of the area and an estimate of the situation to determine the most effective way to use the terrain and available resources. It provides for security forces, forward defense forces and a reserve. It indicates the location of the forward defense area, provides fire support to all defensive echelons, and provides for artificial obstacles and barriers to improve the natural defensive strength of the terrain. It spells out counterattack plans and troops designated for this purpose.

b. Planning Considerations. When planning the defense, the following factors should be considered:

(1) There are about 12 hours of daylight in jungle followed by extreme darkness. Commanders should begin preparation of defensive positions at least two hours prior to nightfall.

(2) The high humidity will adversely affect physical effort and troops should be rested as required.

(3) Tropical downpours will quickly flood positions unless they are adequately drained. This should be considered when siting positions. The high water table during the rainy season often requires defensive positions to be dug on high ground.

(4) Limited fields of observation allow the enemy to approach positions without being detected, facilitate infiltration by the enemy and increase possibility of attack from any direction. The use of starlight scopes and anti-intrusion devices should be considered in planning night defensive positions.

c. Organization of the Ground.

(1) *General.* The battalion and smaller units often operate as independent units. The tech-

niques of perimeter defense are usually used to provide all-round defense. When possible, a natural obstacle such as a river, lagoon, swamp, steep cliff or sea should be considered and integrated in the overall defensive plan. While such features constitute obstacles to the attacker, they are never considered as insurmountable barriers and provisions must be made to meet with fire the enemy who attacks over and through them.

(2) *Preparation of defensive position.* The first step in organizing the ground after securing the area is to place the automatic weapons and prepare fields of fire. Care must be taken to insure that vegetation is not cut unnecessarily. All cutting should be carefully planned and controlled by leaders. Primary and alternate positions are constructed. The short range of observation, short fields of fire and restricted range of automatic fire coverage will require that defensive positions are closely sited for mutual support and to prevent infiltration. Preparations of overhead cover is of paramount importance to reduce vulnerability to high angle fire.

(3) *Strengthening the defensive position.* The natural terrain obstacles should be reinforced with artificial obstacles such as mines, pitfalls, etc. They should be covered by fire and situated where the enemy will be denied observation of them. They should not be located within grenade-throwing range of defensive positions. Their location must be balanced against the thickness of vegetation and possibility of vegetation being destroyed. For instance, a wire obstacle located 10 yards outside a position may be sufficient to prevent grenades being thrown in if the growth is dense, but it would probably not suffice after the growth had been shot away.

d. Organization for Combat. Organization for combat will be based on a consideration of the factors of METT. Normally, three tactical groupings are organized—the security force, the forces in the forward defense, and the reserve. Penetration or infiltration between defensive locations may occur, thus requiring organization that for combat provides for all-round defense. The employment of unattended ground sensors as intrusion detectors is valuable for the early detection of enemy activity; however, the limited visibility and reduced effectiveness of other electronic sensors may require a greater number of troops than normal for security of an area. It is necessary to maintain a mobile reserve force of sufficient size and composition to facilitate rapid reaction in any direction.

e. Command and Control. Restrictions imposed by jungle terrain on maneuver and control place the greatest emphasis on planning, coordination, and small unit leadership. Decentralized control is necessary to allow units to react quickly against simultaneous multiple threats. Effective control by small unit leaders is vital in fighting off sudden assaults at close range. Good fire discipline must be exercised during hours of darkness to prevent firing at unidentified targets, thus disclosing friendly defensive positions, especially crew-served weapons, to the enemy. Of the many problems peculiar to defense in jungle terrain, the most critical is communications. Alternate communications facilities should be provided to the maximum extent possible. An effective communication network within the perimeter enhances the commanders ability to control the effort, influence the action and reduce unnecessary movement.

f. Security and Surveillance Measures. Security is planned to gain early information of the enemy's approach; patrols, sentries, observation post, listening posts, combat outguards and ambushes are used. These outguards form the nucleus of the combat outpost system along critical jungle approaches. They give early warning of the enemy and, within their capability, delay, disorganize, and deceive the enemy as to the true location of the main position. Trip wires connected to noisemakers, antipersonnel mines, or illuminating flares may be installed around the position at night to warn of the enemy's approach. Other means may be used to illuminate the battlefields at night; cans filled with jellied gasoline with a remote system of ignition may be placed in strategic areas and ignited when the enemy approaches. Such devices should be located far enough beyond the position so that the light will not blind the defenders or disclose their positions, yet close enough not to be obscured by vegetation. The effect of all illumination is limited by the heavy foliage and the tree top canopy of the jungle. Additional means to provide surveillance include night vision aids, radar, infrared devices, and a variety of unattended ground sensors. Detailed planning and coordination must be effected by all commanders sending out night patrols. Plans include the mission, composition time and point of departure, time and point of return, routes to be used, sign and countersign, and emergency signals. Patrols' plans are sent to the next higher headquarters for coordination with adjacent units, security elements in front of the for-

ward defense areas, and supporting artillery units.

g. Fire Planning in Defense. Since dense vegetation will restrict effective mutual fire support from adjacent positions, it will be extremely important that plans include centralized control of fire support. Fires are planned and executed as in any other type of terrain, conforming to the desires of the commander and the availability of ammunition. Because of the unusual landforms present in most jungle terrain, it will be difficult to cover all gaps with direct fire. In such circumstances, plans must be made for coverage of these areas with indirect fire. The decreased frontages, shorter distances, and closer intervals between units call for extensive and detailed planning for final protective fires. In jungle defensive operations it is essential that all personnel are familiar with the unit fire plan and procedures for directing these fires.

h. Logistics. Due to the isolated nature of units involved in defensive operations and the configuration of the terrain, both aerial and ground resupply will be limited. For this reason, added emphasis must be placed on supply economy and positioning of supplies to protect them from the elements and to prevent their destruction by enemy fire.

5-19. Conduct of the Defense

a. During small unit operations, there are times when a commander must suddenly revert from the attack to the defense. When this occurs he may have to establish a hasty defense. On those occasions there is little or no time for the application of the techniques and procedures associated with the preparation of a deliberate defense. Such a situation can occur when the enemy suddenly strengthens the objective and the attack is momentarily stalled; or at dusk while the unit is still in contact with the enemy and a night attack is not planned; or when an intermediate objective has been secured and the unit is reorganizing before continuing the attack. During these situations detailed ground reconnaissance, systematic placement of automatic weapons and the placing of sophisticated early warning devices are not feasible. Generally on those occasions the unit is still in contact and is under direct fire from enemy small arms. While the hasty defense concept is applicable to all military operations, it takes on added significance in the jungle due to the proximity of the enemy and the dense foliage and vegetation.

b. When a hasty defense is required, a perimeter defense is established which provides all-round security with the unit command post in the center of the perimeter. While not normally possible when in close contact with the enemy, outposts or other means of local security should be established insofar as practicable. Unit frontages should be drastically reduced, especially at night, to prevent enemy infiltration into the position. Organic mortar fires, and supporting mortar and artillery fires, if available, should be registered as soon as possible and the digging of foxholes initiated at once. Automatic weapons must be placed immediately. These weapons are placed where the vegetation offers the best possible fields of fire.

c. SOP's for this type of warfare must be prepared in advance of actual operation and individuals must be instructed and rehearsed in their application as troop leading procedures by small unit commanders may not be practical.

d. Once the hasty defensive position has been established, weapons emplaced and local security posted, the unit continues to improve the position as in any other type defense. Should circumstances develop requiring a prolonged occupation of the position, the position must be made formidable and the basic doctrine for establishing a perimeter defense applied. Important considerations in this connection are:

(1) The unit front continues to be a circular front.

(2) A reserve is constituted as soon as practical.

(3) Local security is pushed as far forward as possible.

(4) Counterattack plans are developed.

(5) Communications are improved.

(6) Machineguns are employed singularly covering as many enemy approaches as possible. The principal consideration when progressing from a hasty defense to a prolonged defense is to obtain "working room." Often this can be achieved by use of limited attacks, by heavy well-placed mortar and artillery fire, and lastly, by use of close-in automatic weapons fire forcing

the enemy to withdraw. Once the immediate area is cleared of the enemy, the techniques for improving the position described in paragraphs 5-17 and 5-18 apply.

e. SOP's should be developed covering actions to be taken in the event that a prolonged defense is necessary. Strong leadership is required during such actions to insure the morale, health and efficiency of the command are maintained. Troops must not be allowed to become complacent. Inspections of weapons, positions and cleanliness of troops are mandatory to insure the SOP is being followed. Plans for practicing unit alerts, for feeding, for maintenance and bathing, are part of the unit SOP. However, the need to stagger these periods to preclude the establishment of a set routine cannot be overemphasized, as the enemy will take advantage of these periods of reduced effectiveness once he has learned the routine.

f. When a prolonged defensive position has been established, the following special considerations are appropriate and are worthy of consideration:

(1) *Security of area.* Patrols are dispatched to gain and maintain contact with the enemy. Outguards and/or ambushes are set up to cover major avenues of approach. Ambushes should be set up along the route taken by the unit into their defensive position as well as routes utilized by returning patrols. When authorized by appropriate commanders, warning devices in the form of anti-personnel mines, boobytraps, trip flares, vines, noisemakers, and grenades should be installed. Unattended ground sensors can be installed on likely avenues of approach and assembly areas to provide warning and information on enemy activity.

(2) *Forward defense area.* Units should maintain strict fire discipline to preclude compromising exact location of defensive positions. Construction of lightly camouflaged dummy defensive positions can be effective in deceiving the enemy.

Section V. RETROGRADE MOVEMENTS

5-20. General

Retrograde operations are conducted in accordance with the doctrine and principles contained in FM 7-11, FM 7-20, FM 17-1, FM 17-15 and FM 61-100, with consideration to the restrictions on observation, fields of fire, fire support, control,

communications, and movement. A retrograde movement is a planned operation with a positive purpose. Forceful leadership, strict discipline, control, and prior planning are necessary to insure that the intent of the operation is recognized and executed. Special considerations are:

a. Delaying Action.

(1) Long range ground observation and fields of fire can rarely be obtained.

(2) Use of stay-behind forces, long range, security and contact patrols, aerial observation and reconnaissance, and unattended ground sensors to augment ground observation and adjustment of long range fires.

(3) Extensive cutting and marking of trails may be required.

(4) Selection and requirements for preparation of positions for indirect fire weapons.

(5) Lack of routes for lateral movement of units and command and control personnel.

(6) Engagements with the main body of enemy forces may take place at close ranges.

(7) Use of obstacles, demolitions, mines, booby traps, chemicals, (when authorized) offensive action and ambushes to inflict damage on the enemy and to delay him.

b. Withdrawal.

(1) Because of the cover and concealment provided by the jungle, a withdrawal under enemy pressure may be based on deception as in a withdrawal not under enemy pressure.

(2) Routes, assembly areas, and new positions must be thoroughly reconnoitered and should be marked for identification, if it does not compromise secrecy. Increased use of guides will normally be required, especially in areas containing dense vegetation.

c. Ground Sensors. Unattended ground sensors can be employed along trails, roads, streams, rivers and other likely enemy avenues of approach and in likely enemy assembly areas to provide information on enemy movement and activities; information obtained can be used to place long range fires upon the approaching enemy force.

Section VI. OTHER COMBAT OPERATIONS

5-21. Patrolling

a. General. Patrolling is important in all types of warfare; however, it has increased importance under jungle conditions, especially against guerrilla forces. Patrol techniques for the jungle are not basically different, but because of the terrain, vegetation, and usual guerrilla jungle tactics, some modifications to normal techniques and methods are advisable. The basic aspects of patrolling are covered in FM 21-75 and advanced training in this subject, as well as a description of patrolling operations in FM 21-50.

b. Types and Missions. Patrols are classified as either reconnaissance or combat, the designation generally indicating the mission. All patrols are a source of information and must be prepared to report all information, topographical or enemy, which is discovered. Combat patrols are often a good source of information and should be debriefed after every mission with respect to enemy positions, trails, obstacles, terrain characteristics or other important and unusual occurrences. The mission of intelligence cannot be overemphasized in the jungle because of the difficulty in obtaining accurate information from other sources.

(1) *Reconnaissance patrols.* A reconnaissance patrol in the jungle normally should not exceed six men because of the difficulty in moving silently through dense vegetation; a larger number of men is liable to cause noise which would increase chances of detection. Because of the usual scarcity of information about the terrain

and the probable unfamiliarity of troops with the area of operation, these patrols should be detached from a combat patrol when possible. The combat patrol will then have the advantage of some members who are familiar with the terrain in the immediate vicinity.

(2) *Combat patrols.* In jungle operations this type of patrol may be assigned specific missions to:

(a) Attack enemy patrol bases.

(b) Destroy or capture enemy personnel, equipment, installations and cultivations.

(c) Pursue an enemy force after attack by a larger unit.

(d) Provide security.

(e) Ambush enemy elements.

(f) Dominate or interdict an area to prevent enemy elements from contacting friendly civilian elements.

(g) Collect information.

(h) Search specified areas.

(i) Install unattended ground sensors for subsequent surveillance in an area.

c. Influence of Jungle Terrain on Patrolling. Many conditions of the jungle affect patrolling actions. These influencing factors are vegetation, climate, weather, terrain and animal life. This combination of factors and elements severely limits the range, speed and extent of patrol actions.

(1) *Advantages.* In spite of the generally considered hostile nature of these factors some advantages are offered. The dense vegetation af-

fords excellent concealment, and provides some cover which tends to favor the patrolling unit. The dense vegetation and terrain obstacles will also hinder enemy movement and observation. Advantage can also be taken of the elements, such as rain which reduces the sound of movement, or dampness of ground and vegetation which also muffles noise.

(2) *Disadvantages.* Primary among disadvantages brought on by the influencing factors is the problem of control and movement. All movements by troop elements in the jungle must be considered tactical movements. The ease with which enemy elements can infiltrate deep into supposedly secure areas requires that no relaxation into "administrative" conditions or situations be permitted once troops start a tactical operation. This requires extensive control measures that must be effected by all leaders. Rate of movement in primary and secondary jungles is seldom more than one-half mile or one kilometer each hour. Troops must be conditioned to this fact and must learn not to overestimate the distance actually traveled. It is possible to receive air drops in areas where the vegetation is not too dense provided adequate air-ground signals are available. Patrol leaders should attempt to accurately locate cleared areas on the map for later aerial resupply sites or medical evacuations. It would appear that because of the shade provided by trees, movement in the jungle could be made over reasonable distances without great physical discomfort from heat; however, the high humidity and the heat from the ground magnify the sensation of heat. The combination tends to exhaust troops quickly and lessens their normal powers of endurance. Owing to the restricted visibility in the jungle, the only sure means to maintain direction is by compass. Every leader, down to the most junior, must be able to use the compass with confidence and accuracy. Movement through swamps is the most tiring and slowest of the conditions likely to be encountered.

(3) *Minimizing the effects of the influencing factors.* Troops must learn to operate within the limitations imposed upon patrol actions by the jungle; they must become accustomed to the jungle environment and be made to realize that it provides advantageous conditions where successful operations can be conducted.

d. Movement of Patrols in the Jungle.

(1) *Silence.* Silence, with respect to both voice and movement, is essential at all times. With practice it is possible for troops to move at

a good speed in comparative silence. Each soldier should move steadily, deliberately and carefully, parting the undergrowth rather than crashing through. This mistake not only causes bruises, scratches, and loss of direction, but is also very noisy. When possible, troops should avoid walking on dry leaves, sticks, rotten wood, etc.

(2) *Cutting trails.* Troops should use their machetes to cut trails only as a last resort or to avoid excessive detours. There is nearly always a route nearby where movement will be easier. Cutting a trail has the following disadvantages:

- (a) It is not silent.
- (b) It reduces speed of movement.
- (c) Fatigue of soldiers in the leading element is increased.
- (d) Handling of weapons is difficult.
- (e) It leaves a well-marked trail.

(3) *Trails and trail discipline.* Movements on trails should be avoided; however, it may sometimes be necessary when speed is essential or when moving in mountainous country. Not only should patrols avoid established trails but should make all possible effort to hide signs of movement to prevent leaving a trail themselves; this is extremely important when moving through virgin country and in proximity of the enemy. Some additional considerations are:

- (a) All troops should wear the same pattern sole on the combat boot.
- (b) Troops must be required to observe trail discipline. They must NOT signpost the route with litter and waste food; these should be buried carefully. Troops on patrol should be permitted to carry only the barest essentials when operating. Leaders must be constantly alert to prevent men from plucking leaves or breaking twigs, especially at halts.

(c) When patrols move through close, hilly country, troops should avoid small saplings. The shaking of overhead branches can be seen and heard at a distance.

(d) When moving through tree cultivations, patrol members must keep off trails, if only by walking a few feet off these trails.

(4) *Speed of movement.* Speed of movement is dictated by the nature of the terrain, the mission, and requirements for security. Speed in moving from one location to another will be better obtained by intelligent route planning than by trying to push quickly and blindly forward. It is important to emphasize that speed will always be limited by the necessity to avoid noise in movement; also, movement must be expected to be

painfully slow. Movement in the jungle is fatiguing, both physically and mentally, and a balance between the desire to move quickly must be maintained with the necessity of keeping troops fresh, strong and alert for enemy ambush and action once the objective is reached. Halts must be called for observation, listening, and resting as required; terrain difficulties will usually dictate when to take breaks. When halted, troops must always take up positions providing for all-round security. When marching in single file it may be necessary to delegate responsibility for protection and lookouts down to individuals. As a guide, it is suggested that, when working out times for rest halts, the patrol leader consider the terrain over which the unit is moving. In relatively easy terrain, he should start with the usual ten minutes every hour for rest breaks. However, when traversing difficult terrain, halts must be more frequent; only a patrol leader who knows the physical condition of his men can determine how frequent these halts should be. After passing through a swamp or climbing a steep slope, it is a good plan to call a short break to ascertain that the entire patrol has passed through the difficult area. If this is not done, only the leading elements will be rested. Of more serious consequences will be the detrimental effect on morale.

(5) *Observation.* A soldier must notice every sign of movement around him, all marks or signs on the ground, and all instances of broken, cut or trampled vegetation. The sense of smell must be keen and free from cigarette smoke, the odor of candy, hair oil, shave lotion, or talcum so that the individual soldier will immediately notice any strange smells. Periodically, depending upon how close the patrol leader suspects the enemy to be, the patrol should stop and listen. At halts, every member of the patrol concentrates on listening and reports anything he hears. Troops must be trained to disregard the general pattern of foliage surrounding them and to look "through" rather than "at" the vegetation. A better view is often obtained by looking through jungle at ground level. If any unusual sign or sound is noted a patrol must "freeze" in place silently; there should be no other movement until the patrol leader or scouts have investigated the situation.

e. Control Measures. It is obvious that when confronted with the many problems presented by the jungle a patrol leader must concern himself with the means to control his force. Voice commands and other audible signals are of limited effectiveness and are a threat to secrecy. The most

effective control means available to a patrol leader are silent arm and hand signals which are outlined in FM 21-60; however, signals must be kept to a minimum commensurate with the needs of a patrol.

(1) *Formations.*

(a) *Squad.* Generally, two types of formations for squad-sized patrols will suffice for movement in the jungle. These are the single file and column formations.

(b) *Platoon.* The squads of a platoon will usually have to move in file or column formation in the jungle. At times the nature of the terrain may require a more open formation; in this case rifle squads may move, two or three forward, on parallel axes. The patrol leader must constantly analyze the terrain and vary formations of the patrol to suit it.

(2) *Position of leaders.* Squad leaders should remain with and control their squads. This can usually be done from near the head of the column; maximum use should be made of fire team leaders to maintain control and man-to-man contact with squad members. Leaders of platoon-sized or commanders of company-sized patrols will be located within their patrols according to the dictates of the situation and the formation used. These positions should be sufficiently forward to—

(a) Allow the leader to influence the action from the start. Although it is not desirable for the leader to be caught in opening bursts of fire, he should place himself where he can direct and quickly exploit immediate action drills.

(b) Enable the leader to exercise and enforce control measures, control the point and navigation team, read the map, and order halts properly when deemed necessary.

(3) *Guides.* The word "guide" as used here means someone who has an intimate knowledge of an area or who can lead friendly forces to a known enemy location. Guides may be surrendered enemy personnel, or natives of the area. Information received from any of these sources should be carefully evaluated and used with reservation. It is unwise to completely depend upon all information offered by "friendly" natives or captured enemy personnel. The patrol leaders must exercise full command and control of the patrol and must avoid the tendency to allow the guides to lead the patrol. A guide's function is merely to show direction and provide information. If enemy troops are encountered en route, guides may panic and prejudice the patrol's chances of accomplishing the mission. Patrol

leaders must be wary of being led into an ambush by treacherous but seemingly well-meaning guides. The correct position of a guide, if used on a patrol, is to be with the patrol leader. The patrol leader will make decisions as to direction and tactics, using as deemed appropriate, the guide's advice.

(4) *Maintaining contact.* The patrol leader must always adapt his speed of movement to that of his rear and flank security elements. Responsibility for maintaining contact must be from front to rear.

5-22. Ambush

a. General.

(1) An ambush is a specialized form of combat in which the principles of concealment, surprise, and offensive action are used to reduce the enemy's combat effectiveness when they are on the move or temporarily halted by inflicting heavy casualties and causing confusion. In no other type of military action is the ambush more important, more effective, or more frequently employed than in jungle combat. The basic elements of ambush are covered in FM 21-50, FM 21-75, and FM 31-16; however, a detailed discussion of this subject is included in this manual because of its application in jungle operations.

(2) Ambush may be defined as: "A trap sprung on a moving enemy and is based on concentrated surprise fire from concealed positions." Special note should be taken of the words "trap" and "sprung" and the phrases "concentrated surprise fire" and "concealed positions." A trap is "sprung" because an intense volume of fire is delivered into the killing zone. These fires can be directed at a single point or designated area and the delivery is made suddenly, violently, and without prior indication. "Concealed positions" prevent members of the ambush and their equipment from being prematurely seen by the enemy. Surprise is essential for a successful ambush.

b. *Purposes of Ambush.* Ambushes are executed for the general purpose of reducing the enemy's overall combat effectiveness and for the specific purposes of destruction, harassment, and gaining intelligence information.

(1) Destruction is the primary purpose, because loss of men and equipment cause the enemy to divert troops from other missions to protect himself against ambush. The failure of the enemy's reconnaissance and combat patrols to accomplish their missions because they were ambushed deprives him of valuable contributions

which these patrols would make to his combat efforts.

(2) The damage caused by the harassment of frequent ambushes is less apparent than physical damage, but is very important. When ambushes are frequent, troops tend to be reluctant to go on patrols and move in convoys, or small groups. They become less aggressive and more defensive minded; they avoid night operations, become more subject to confusion and panic if ambushed, and in general, decline in effectiveness.

(3) An ambush may be an ideal method to obtain intelligence information. A successful ambush enables the unit to capture prisoners, documents, enemy equipment, to make identification of enemy units by observing insignia on dead or captured soldiers, and to obtain information on the status of enemy training.

(4) Patrols operating deep in enemy areas may be able to partially or completely resupply themselves through ambushes set to seize supplies and equipment, thus increasing combat effectiveness at the expense of the enemy. In many instances, this is the primary source of supplies and material for guerrilla elements.

c. Types of Ambush and Ambush Formations.

(1) *Types of ambush.* The two basic types of ambush are point and area.

(a) A point ambush is one where forces are deployed to engage the enemy in a single killing zone.

(b) An area ambush is one where forces are deployed as multiple related point ambushes.

(2) *Ambush formations.* Formations are identified by the general pattern formed on the ground by deployment of the attack force. Common formations are Line, L, Z, T, V, Triangle (Open and Closed) and Box. The formation to be used will be determined by careful consideration of the advantages and disadvantages of each in relation to the following: terrain, conditions of visibility, forces, weapons, equipment, control, target to be attacked, and overall combat situation.

(3) See FM 21-75 for a detailed explanation of the types of ambush and the various ambush formations.

d. Fundamentals of Successful Ambush.

(1) *Surprise.* The most important element of an ambush is surprise; if surprise is not achieved, there is no ambush. It is the decisive factor which shifts the immediate control of the combat situation to the ambushing force by striking the enemy when, where, and in a manner for

which he is unprepared. If the enemy cannot be taken completely by surprise, he must become aware too late to react effectively. Surprise can be achieved by speed, secrecy, deception, by variation in means and methods and by using seemingly impossible terrain. Effective firepower must exploit surprise.

(2) *Control*. Control is difficult to establish and maintain. Control is necessary during the movement to, occupation of, and withdrawal from the ambush site. The most crucial time of the ambush operation is the moment of execution. Control measures must be provided for opening fire. The time the enemy's lead element arrives at a certain location may be designated as the time to open fire. In any event, opening fires must be in direct control of the ambush commander. Communications with security elements is essential. Exacting control must be exercised to insure that the ambushing force is alert and silent. Assembly and rallying points are designated to assist in control during withdrawal.

(3) *Concentrated fires*. The short killing time demands highly concentrated fires which are achieved by careful planning and positioning of weapons. The fires of all weapons, including rifles, close-in automatic weapons, rocket launchers, grenade launchers, claymore mines and other weapons are tied into the fire plan. The assignment of sectors of fire, and the location of friendly elements are considered. Plans are made for isolating the ambush area to prevent escape and reinforcement by the enemy. Effectiveness of the ambush depends upon the surprise delivery of a large volume of fire. Fire from at least two directions and converging on the target is desirable; care must be exercised to prevent friendly troops from firing into other friendly positions of the ambush when converging fire is used.

(4) *Simplicity*. Another essential fundamental of the ambush is simplicity. Simple plans and orders are easily understood and executed, particularly if the ambush is to be in position for a long period of time; lengthy, detailed orders are not likely to be remembered exactly and, consequently, are either not carried out or are misinterpreted. This may occur even after detailed rehearsals.

(5) *Concentration of action*. Once sprung, an ambush must use all available firepower. To do this requires careful attention during training. Under excitement some men will shoot ineffectively, or fail to fire their weapon.

(6) *Discipline*. The last fundamental is self-discipline. Remaining in a set ambush can be

a boring and uncomfortable job. It may be necessary for the soldier to forego smoking, to endure in silence, insect bites, thirst, and the desire to ease cramped legs, or to perform normal body functions. Extensive and continuous training is necessary to develop the required patience and self-discipline.

e. Planning and Preparation. The plan for an ambush must provide for every eventuality that may be encountered during movement to, conduct of, and return from the ambush, and it must be rehearsed in detail. A deliberate ambush permits detailed planning since sufficient reliable information is available on intended or established patterns of enemy movement. In a hasty ambush or ambush of opportunity there is not sufficient information available on intended or established patterns of enemy movement. In a hasty ambush or ambush of opportunity there is not sufficient information to permit detailed planning. Planning for such an ambush must include tentative plans for varying types of targets and situations. In both, plans must be flexible enough to allow modifying, as appropriate, at the ambush site. Planning must provide for the following:

(1) *Simplicity*. When developing the plan, it must be kept simple to eliminate confusion. If one man forgets what he is supposed to do, the entire ambush is endangered.

(2) *Type of ambush*. The type of ambush must be determined and stated in the plans. Type of ambush affects organization and number of men, equipment and communications required.

(3) *Deployment*. Each possible formation should be considered for its advantages and disadvantages.

(4) *Organization and size of ambush force*. The ambush force is tailored for its mission. Two men may be adequate for a harassing ambush, whereas a platoon or greater size unit may be required for a destruction ambush. Determining factors will be the purpose of the ambush and the target to be attacked.

(5) *Equipment*. Proper equipment to accomplish the mission and meet emergencies must be planned for. Each man should carry a basic load of ammunition, and maximum use should be made of grenades and claymores. All equipment should be muffled or taped to prevent noise.

(6) *Reaction force*. A reaction force should be planned for and prepared for each ambush patrol. Normally, a reaction force will only be employed when the patrol encounters serious difficulty.

(7) *Site.* When siting an ambush the terrain must be carefully analyzed. A careful study must be made using maps, aerial photographs, and when possible, a personal reconnaissance. The ground must enable occupation and/or preparation of concealed positions. All reconnaissance and movement into position must be from the rear of the selected ambush position. Covered routes of withdrawal should be available to enable the ambush to break contact and avoid pursuit by fire. Favorable fields (tunnels) of fire must be allowed the ambush. The site selected should impose canalization of the enemy force into the killing zone; the site should, of course, afford a position insuring contact with the enemy. The site must contribute to, or at least not detract from, the surprise of the ambush. Considering this, the ambush patrol leader does not have to select the best ground or terrain suited tactically for his ambush. Many times the selection of a site for surprise alone will be more advantageous than attempting to ambush an enemy from a spot of which he is sure to be suspicious. Therefore, the ambush might be laid downhill from the enemy as well as uphill. When downhill from the enemy, it becomes more difficult for him to escape since he will have to escape uphill. If the ambush is uphill from the enemy, it is easier for him to escape by running downhill. However, if advantage is taken of natural obstacles or mines, the uphill position should be the more successful of the two.

(8) *Positions.* Security forces are positioned first to prevent surprise while the ambush is being established. Automatic weapons are then positioned so that each can fire along the entire killing zone. If this is not possible, overlapping sectors of fire are designated for these weapons so that the entire killing zone is covered. The force leader then selects a position from which he can best determine when to initiate the ambush. Riflemen and grenadiers are then placed to cover any dead space left by the automatic weapons. All weapons are assigned sectors of fire to provide mutual support. For the most part, ambushes in jungle operations are sited along passable trails. Ambush personnel have to be positioned where they can see enemy personnel and not necessarily the trail itself. The ambush leader sets a time by which positions are to be prepared; the degree of preparation depends on the time allowed. All men work at top speed during the allotted time.

(9) *Camouflage.* Camouflage plays an important role in the ambush. The purpose of the

ambush is to kill the enemy by surprising him, and to do this each member of the ambush force must be hidden from the enemy's view. After going into position, each man carefully conceals himself and the leader checks all positions for proper concealment. Lastly, there must be no unnecessary talking, smoking or movement. If reliefs are to be used, they should be prearranged. Once the relief begins, only a few men should move at a time, because it is less likely that one or two men moving at once will be spotted, whereas if the entire relief moved at once, the chances of being seen would become much greater. In no other operation is camouflage discipline more important than in the ambush. Weapons should fire through screens of undisturbed, living foliage, and all spoilage resulting from preparation of positions should be removed.

f. Conduct of the Ambush.

(1) *Signals.* An ambush leader will need at least three signals for his ambush: a warning signal, a signal for execution, and a signal for withdrawal. The warning signal should be a silent signal. Examples of silent signals are hand and arm signals and vines, cords or nylon fishing line laid across the arms or ankles of selected members of the patrol. When the enemy comes into sight the sentry pulls on the vine or cord which alerts the ambush leader. He, in turn, alerts the other members of the patrol. The signal for execution may be the exploding of mines, rapping or snapping sounds such as hitting the helmet with a stone, hitting two metal objects together or a voice command. For the signal to withdraw, voice commands, whistles or pyrotechnics may be used. Signals should be changed frequently to prevent compromise.

(2) *Execution.* The ambush force must wait until the target is well within the killing zone. The force leader or someone designated by him is responsible for triggering the ambush. Judgment must be exercised in deciding the exact moment to trigger the ambush. Premature triggering can result in a failure of the ambush as well as placing the ambush force itself in danger. Upon initiation of a definite and definable signal, the ambush will be executed. The force must lay down an immediate heavy volume of fire. Properly timed and delivered fires contribute heavily to the achievement of surprise as well as to the destruction of the target. Initially, fire must be low and then adjusted on target. When the target is to be assaulted, the lifting or shifting of fires

must be equally precise to prevent the target from reacting.

g. Withdrawal. Following the successful completion of an ambush, the leader will initiate the withdrawal signal and the force will move back to a predesignated rally point, completing necessary reorganization, and then returning to the base of operations. If the force has an assigned mission of searching the dead for documents, seizing equipment, or taking prisoners, this is accomplished by that portion of the force assigned this task while the other members of the force would cover them. The force then withdraws in the same manner as previously described. If the ambush cannot overcome the enemy column, the force should immediately withdraw and rapidly move to the rally point, quickly reorganize and depart the area. Regardless of what happens, on receiving the withdrawal signal all elements withdraw along a previously reconnoitered route to the rally point. Situation permitting, each member of the force selects a route to the rally point prior to the execution and walks this route until he can follow it even in the dark. The rally point is far enough from the ambush site so that there is no danger of its being overrun if the enemy attacks the ambush. At the rally point the force is checked for missing members and casualties, then moves on its return march.

5-23. Defense Against Ambush

a. General. Since ambushes are more frequently and more effectively employed in jungle combat than any other type of combat, a unit moving through jungle terrain must take all possible measures to reduce its vulnerability to ambush. The most effective means of combatting an ambush is to discover it before entering the killing zone. However, this is not always possible. A necessity for speed in movement, coupled with heavy jungle, may require movement on roads or trails, thus increasing a unit's vulnerability to ambush. For this reason, active measures will have to be supplemented by passive defensive measures in order to destroy or escape from an ambush.

b. Precautionary Measures.

(1) *Dismounted troops.* Dismounted troop units have the advantage over mounted troops in avoiding ambushes since they are not bound to the obvious routes of movement. Although ambushes against dismounted troops are the most difficult to conduct, the limited visibility and excellent cover and concealment found in jungle

terrain favor the use of ambush tactics. Commanders responsible for movement through jungle terrain must plan for the following:

(a) *Preparing for movement.* The commander makes a thorough map reconnaissance of the terrain over which he will move his unit. If possible, an aerial reconnaissance should also be accomplished. An evaluation of the terrain should be made from the enemy point of view in determining likely ambush sites. Since maps of jungle terrain are often inaccurate, the terrain must be considered in relation to the latest available information. An aerial reconnaissance of the area will assist in comparing maps to the terrain and can provide information on the density of vegetation and seasonal condition of streams.

(b) *Formation.* Formations which provide security to front, flanks and rear must be used. In the jungle, troops usually move in a column or file. This is necessary for control purposes due to the dense undergrowth which hinders but does not preclude the use of a point, flank, and rear guards. The interval between men should be about five yards where visibility permits. The commander should be well forward in the column and the firepower of the unit should be evenly dispersed throughout the column. Then, if ambushed, not all of his firepower, machineguns and other major weapons are subject to destruction in the initial burst. Variations of formations to change the locations of communications, leaders, and automatic weapons within the unit should be practiced. These variations may simply be formation changes during the conduct of one particular movement. Variation of patterns and formations will require similar changes in the organization of the ambush force; hence, random changes in organization during movement may prevent the enemy from reorganizing in time to properly engage the unit.

(c) *Security.* Since the ambush, ideally conducted, is not discovered until the ambush is sprung, the effective preventive measure is the employment of all around security. Alert scouts and patrols will detect ambush sites by searching out suspected areas, observing indicators, or by drawing fire. When moving along trails in dense jungle, maintain complete silence as poor noise discipline on the part of the enemy can result in early detection and circumvention of an ambush. Regardless of the formation employed, security to the front, rear and flanks is necessary at all times. A front security element should provide its own flank security, be placed well forward, or as

far forward as possible and still be in communication with the main body. The front security element must be strong enough to sustain itself until followup units can be deployed to assist in reducing the ambush. Flank security elements in the jungle usually must move adjacent to the column along routes paralleling the direction of march. The flank security elements must be close enough for control and yet distant enough to provide adequate reaction time and space to the main column in the event the enemy is contacted. Rear security elements perform similarly to the point; they can be used as a maneuver element in the event of ambush.

(d) *Control.* All available means of communications are used to assist in maintaining control. In addition, detailed prior planning, briefings, and rehearsal for all personnel will permit rapid actions and orders when an ambush does occur. It must be remembered that in the jungle there is no substitute for personal contact effected by leaders with their subordinates to insure maximum control of their forces.

(e) *Special equipment.* Additional items of equipment and weapons are sometimes needed by a unit, especially when it moves through areas where guerrillas are likely to be encountered. Additional automatic weapons may be necessary; pioneer tools and mine detectors are used to detect and reduce roadblocks or minefields. Demolition equipment is used to destroy obstacles encountered en route. Additional communications equipment and identification devices such as panel sets, lights, or smoke grenades may be required.

(f) *Fire support.* A detailed fire support plan to include planned fires on likely enemy ambush sites is necessary along with on-call air support and ground and airborne forward air controllers, when available. Coordination with the fire support units includes: route to be followed; scheduled and on-call fires; call signs and fires; checkpoints, phase lines, and other control measures; times of departure and return.

(2) *Mounted troops.* Roads are extremely scarce in jungle areas. In some locations, however, the jungle edge is adjacent to roads, making ambush of vehicular columns extremely easy; units must consider the danger of ambush ever present regardless of the tactical or administrative situation. Although ambush of vehicular columns is a primary tactic of guerrillas to obtain supplies, it must be expected that more conventional enemy forces will employ this technique whenever possible. Properly applied precautionary measures

will minimize the incidence of this type of ambush. All roads should be classified into categories with the classification being based primarily on estimated enemy action in the areas concerned. Traffic on all roads in combat areas must be rigidly controlled and kept to a minimum. All vehicles must have at least one armed rider as air-ground guard and travel at night must be restricted, unless the enemy has air superiority. Armored vehicles should be used to escort convoys, and information relating to convoy or vehicle movement must be carefully guarded. Every unit should formulate comprehensive standing operation procedures covering movement by roads. This SOP should state clearly who is authorized to put a convoy on the road and should also provide detailed information concerning the appointment and duties of convoy and vehicle commanders, the organization of convoys, weapons and basic loads to be carried, instructions regarding windshields, tailgates and tarpauling of vehicles, stipulated immediate action drills, and instructions to describe security policies.

(3) *Watercraft.* The ambush of boats and small craft moving along narrow jungle waterways is similar to the ambush of mounted troops. The problems are amplified by the fact that prior to any effective counteraction, troops must first reach shore. Further, point and flank security are difficult, making this type of movement extremely vulnerable to ambush. For further considerations of defense against ambush of watercraft, see paragraphs 5-30 through 5-33.

c. Counterambush measures.

(1) *General.* Personnel must be trained in how to discover and/or defeat enemy ambushes. They must be proficient in countermeasures which can be taken when ambushed that will not only reduce the effectiveness of the ambush, but also may reduce incidence of ambush. The key is early detection followed by immediate and vigorous reflex-type counteraction, application of maximum firepower and relentless pursuit. The most effective means for a unit to counter ambushes is by application of appropriate immediate action drills. Commanders should insure that these drills are well rehearsed and that every man understands what he is supposed to do. Immediate action drills are covered in detail in FM 21-75.

(2) *Dismounted troops.* When ambushed, dismounted troops within the killing zone must react immediately and violently without orders to overcome the initial advantage gained by the enemy. Because an ambush is designed to immedi-

ately inflict maximum casualties and, normally, no attempt is made to prolong the engagement, immediate reaction to build and retain fire superiority is the best initial defense against the ambush. The two techniques commonly used to counter ambushes in jungle terrain are—

(a) In ambushes where the ambushing force is deployed at a distance from the killing zone, the force being ambushed will have some space for maneuver and some opportunity to seek cover at a lesser risk of destruction. In this instance, the element which receives the initial fire takes cover and immediately returns a maximum volume of fire. As the element strives to gain fire superiority, the elements that escaped the initial burst begin predrilled maneuvers to envelope the flanks without further orders.

(b) In ambushes where the vegetation is extremely dense, the killing zone will be under heavy, highly concentrated, close-range fires. This will provide little time and space for men to maneuver or seek cover. The longer they remain in the killing zone, the more certain their destruction. In this instance, the element initially fired upon returns fire and immediately assaults directly into the ambush positions. This action moves them out of the killing zone and prevents other elements of the ambush from firing on them without firing on their own men.

(3) *Mounted troops.* When ambushing mounted troops, the enemy will usually choose a location where he can deliver fires at point blank range and from above into the canopy. The drivers of vehicles which receive the initial fire should attempt to drive on through the ambush killing zone before allowing the vehicle occupants to detruck for counterattack purposes. Vehicles approaching the killing zone should not attempt to run through the ambush; rather, they should halt clear of the area and discharge occupants for deployment. In ambushes of this type offensive maneuver is normally carried out by those troops who are clear of the killing zone. If no such troops are available, then a frontal attack under concealment of smoke, if possible, will be necessary.

(4) *Watercraft.* Measures to counterambush of watercraft are covered in FM 31-75 (Test).

5-24. Relief and Passage of Lines

a. *General* When tactical jungle operations continue over a prolonged period, conservation of fighting power, maintenance of effectiveness, and

the tactical plan may require periodic relief of committed units. Such reliefs are accomplished by a relief in place or a passage of lines. The basic principles of relief operations apply to jungle combat; however, certain modifications will be necessary. For detailed information on relief operations, see FM 61-100.

b. *Basic Considerations.* The following considerations are peculiar to planning and execution of all types of relief operations conducted in the jungle:

(1) The reduced visibility found in most jungle areas will permit units to conduct relief operations during the day.

(2) To prevent congestion as well as detection by the enemy, increased emphasis will have to be placed on coordination and liaison.

(3) During relief operations in the jungle, movement will be by stealth, especially during hours of daylight. Stealth combined with complexity of the terrain will make movement very slow and difficult.

(4) Increased emphasis will be placed on communications to insure adequate control.

(5) Joint patrolling should be conducted to insure that the incoming unit is completely familiarized with the terrain and the enemy situation.

5-25. Raids

a. *Jungle terrain* lends itself to raid operations. The limited visibility and excellent concealment enable skilled raiding patrols to penetrate deep into enemy territory. A platoon or smaller size unit is best suited to rail type operations in jungles. Supporting fires should be planned and used, if available, but the problem of fire control, the timing of operations and difficulties of communications make the employment of fire support difficult. The execution of raids that require deep penetrations into the jungle will be affected by the physical endurance required of the men to traverse the terrain, the lack of detailed information of the enemy positions, resupply and evacuation. This can be minimized by establishing a patrol base near the general area of the final objective. From there, reconnaissance patrols can be dispatched to scout the enemy positions. Meanwhile, other members of the raiding force can be allowed to rest and to complete preparations for the raid. Whenever possible and practicable, aircraft or watercraft should be used to transport raiding patrol members into or near the general area of the objective. This will enable the raiding patrol to reach their objective faster and in bet-

ter physical condition to accomplish their mission. The limiting factors in the use of aircraft and watercraft are landing areas, load capacity, and the possible loss of the element of surprise due to the noise, and hydrographic limitations.

b. For a discussion of the general principles governing conduct of raid operations, see FM 21-50 and FM 21-75.

5-26. Village Seizure and Search Operations

a. *General.* When intelligence has reported enemy activity in a jungle village, a unit may be given the mission to isolate the village and conduct a search for enemy personnel, weapons, documents, and supplies. Most jungle villages are of two types. The most common is the small village, which usually consists of a collection of huts or houses covering a very small area and a trail running through the center. The other is a settlement, or large village, generally consisting of several scattered groups of huts or crude houses. There is usually a main trail or "street" running through the area and a number of subsidiary trails linking the groups of huts. Jungle villages are often under some type of enemy control or duress. Enemy forces will attempt to obtain intelligence, food, clothing, money, and recruits from these villages in order to sustain their operations. The village may be used as a hiding place for weapons, ammunition, as well as enemy forces themselves. Members of the village are often recruited by the enemy to provide information on friendly movements. Any form of human habitation in the jungle or on its periphery within a unit's area of responsibility will have an effect on its combat operations. The ability to effectively isolate and search a jungle village will result in the reduced effectiveness of the enemy and in encouragement of the local populace if adequate protection and support for the people is subsequently provided. The methods and procedures used to fight in these villages will generally follow the principles set forth in FM 31-50. However, jungle village fighting has its own peculiarities and requires modification to the standard techniques of combat in built-up areas.

b. Planning the Operation

(1) *General.* Each village seizure and search operation must be carefully and completely planned, based on current intelligence. Orders should contain considerable detail and be capable of rapid implementation. They should be accompanied by detailed briefings using a sandtable

mockup of the target village. If possible and within security limitations, rehearsals should be conducted using a similar village. The operation is normally planned in three phases: in the first phase the village is isolated by encirclement; in the second phase the isolated area is cleared up to the village and the village is seized; and in the third phase the village is searched. Methods and techniques should be varied from operation to operation to avoid set patterns.

(2) *Security and surprise.* Security and counterintelligence take on great importance during all planning and briefing phases before the operation. Proper physical security measures and deceptive measures will have to be employed during movement to the target village to prevent the enemy from learning its true destination. Proper security will permit surprise, which is essential to the success of this type of operation. Depending on the proximity of the jungle to the village, helicopters can provide an excellent means of rapid and secure movement to the village. When undertaking this type of operation excessive and apparent reconnaissance of the area should be avoided to maintain secrecy. Required information concerning the terrain should be obtained from aerial photographs.

(3) *Organization.* The unit may be organized as a combat patrol. Within the unit provisions should be made for a headquarters element, a blocking force, and an assault force.

(a) *Headquarters element.* This element will be responsible for conduct of the operation.

(b) *Blocking force.* This force will be used to isolate the village during the isolation phase. Sufficient forces must be available to hold the line of encirclement and to provide a reserve capable of dealing with any enemy threats which may develop during the operation.

(c) *Assault force.* Once the village is isolated this force will move into the village itself, seize it and search it. The assault force should be organized into the following elements:

1. *Reconnaissance element.* This element will be the lead element of the assault force which moves out from the line of encirclement to seize the village. They provide early warning for the assault force.

2. *Search element.* This element will conduct the detailed search and clearing of the village. If a language barrier exists, the search force should include sufficient interpreters to insure adequate communication. These interpreters should represent the local, recognized government. Whenever possible, the personnel who ac-

tually conduct the search should be indigenous forces.

3. *Fire support element.* This element will provide fire support for the assault force and later for the search teams should it be needed.

4. *Control element.* This element will assume control of civilians and prisoners of war. Depending on the size of the operation, this team can be supplemented with POW interrogators, psychological warfare personnel and civic action personnel.

(4) *Special equipment and material.* Consideration should be given to the utilization of special equipment that may increase the thoroughness of the search as well as speed it up. Examples of special equipment that can be used in conjunction with search operations are: mine detectors, smoke generators, and smoke, fragmentation and tear gas grenades. Scout dogs can also enhance the operation by providing additional security and assisting in the detection of enemy personnel and equipment.

c. Conduct of the Operation.

(1) *Phase I, isolation.* Most isolation operations are a form of encirclement. Units will normally establish bases after the approach march to the objective village. These bases should be at a distance from the village to prevent their detec-

tion. The unit will move from the bases to easily definable release points, which will serve as a control measure. Once all members of the unit are in position at the release points, simultaneous movement begins toward the line of encirclement. Movement should be such that all forces arrive at their portion of the line of encirclement at the same time. Once all forces make contact with adjacent forces on both flanks and the encirclement is formed, the isolation operation is complete. (see fig. 5-8).

(2) *Phase II, seizure.* After the village is isolated those members designated as assault force will move to the village itself and establish a cordon. The cordoning of the village can be accomplished in any one of the following methods.

(a) *Tightening the encirclement.* This method is used when the village is small and the enemy force is weak in relation to friendly forces. In jungle terrain this method requires emphasis on control to prevent the creation of gaps during movement and to insure that assaulting groups are not fired on by another group. The enveloping force should develop depth by positioning multiple reserve forces as the circle tightens to seize the village. This will make a breakthrough in strength by the enemy more difficult. This method of seizure should be considered

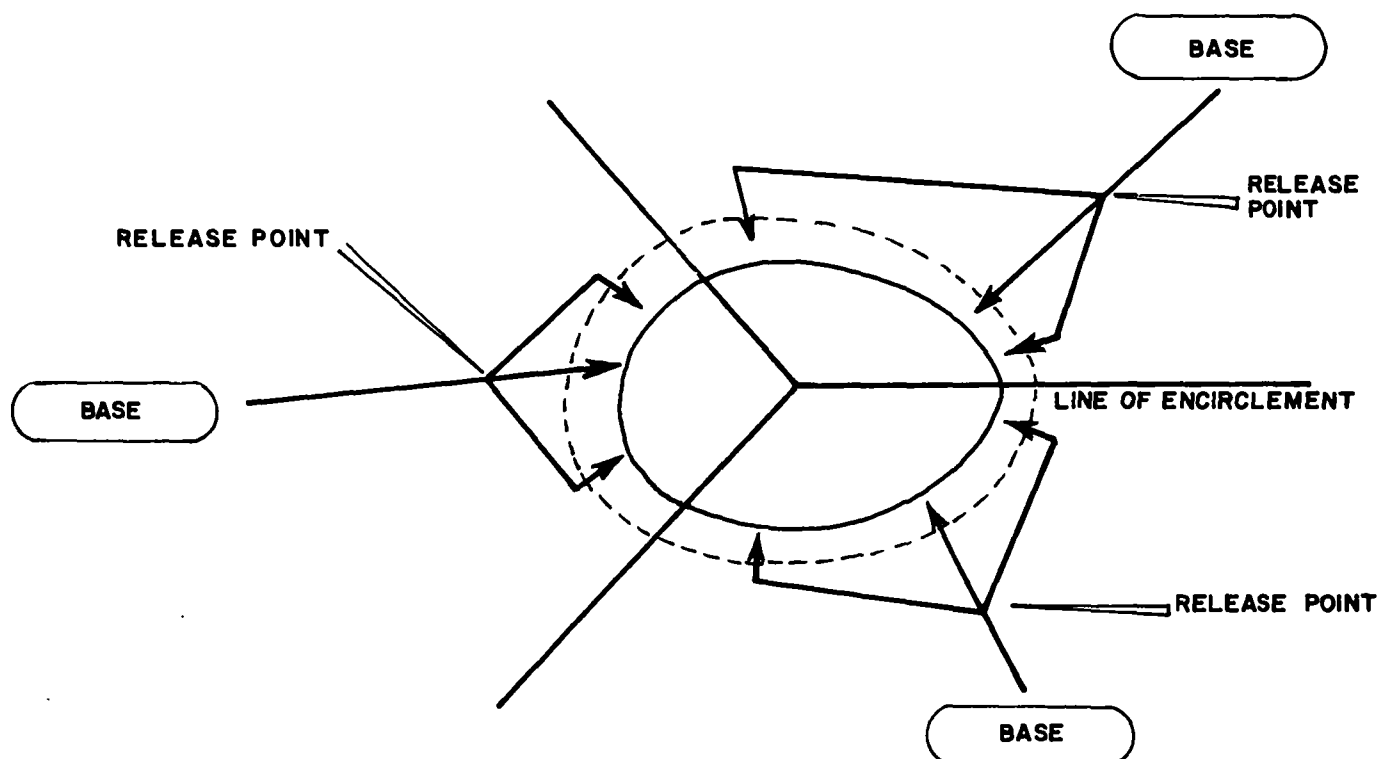


Figure 5-8. Movement to line of encirclement.

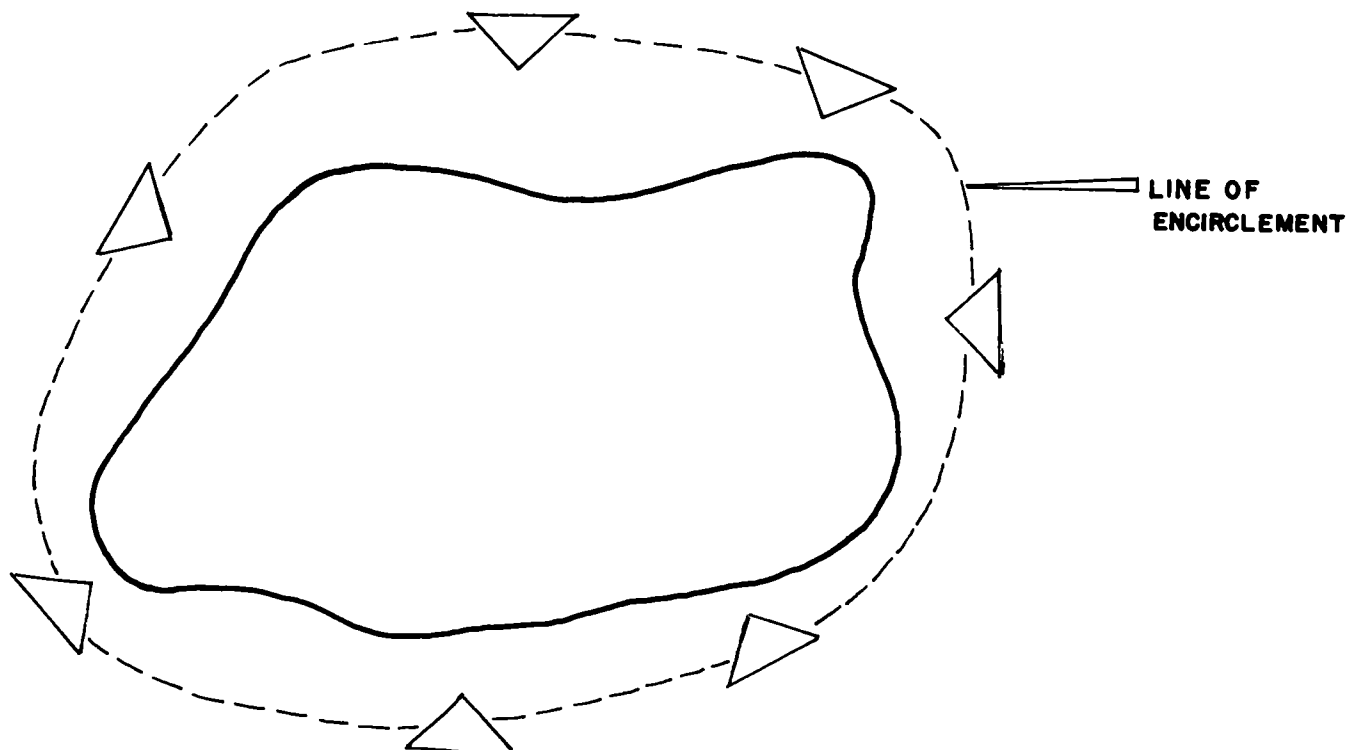


Figure 5-9. Tightening encirclement.

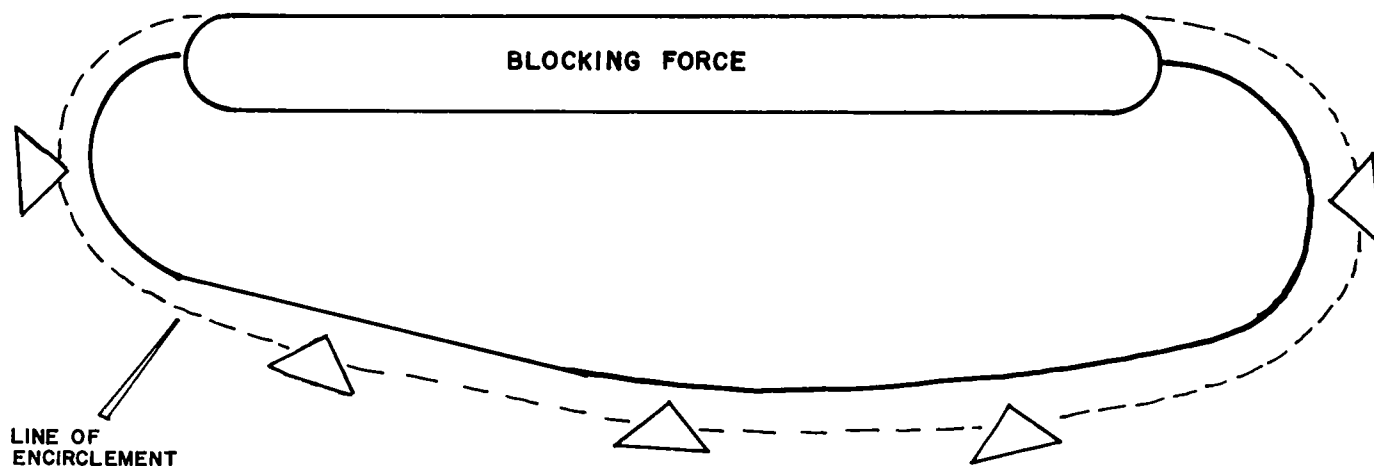


Figure 5-10. Hammer and anvil.

when there are many avenues of escape open to the enemy (see fig. 5-9).

(b) *Hammer and anvil.* This method is characterized by the use of blocking forces and a mobile driving force which is organized in depth. It is usually used when part of the line of encirclement is a natural barrier such as a cliff or river. Once the blocking forces are in position the lead elements of the driving force will move quickly through the area, bypassing pockets of

resistance. The bypassed pockets of resistance will be eliminated by those forces following the lead elements or by the reserves (see fig. 5-10).

(c) *Spearheads.* The third method is to hold the line of encirclement and drive spearheads through. This method is characterized by speed and is used when sections of the village are dispersed or several small villages are located in proximity to each other. This method is more vulnerable to ambush than the other methods.

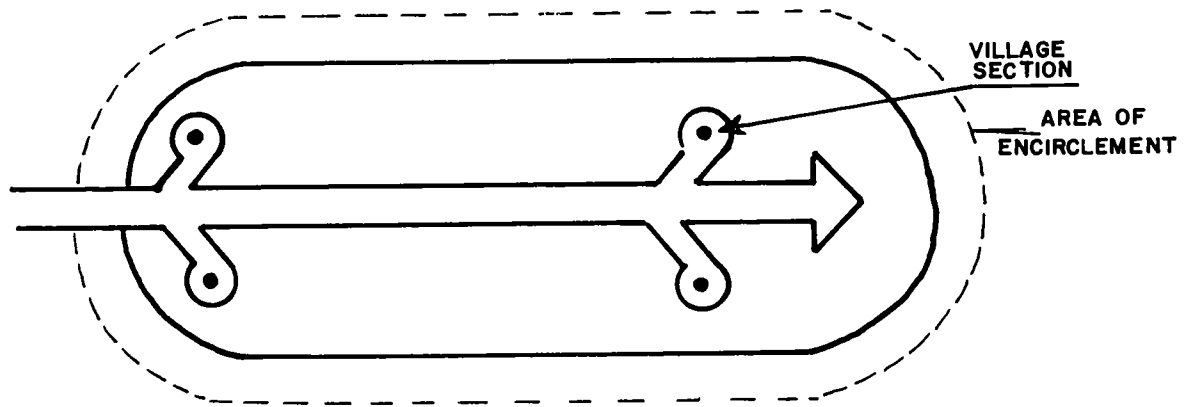
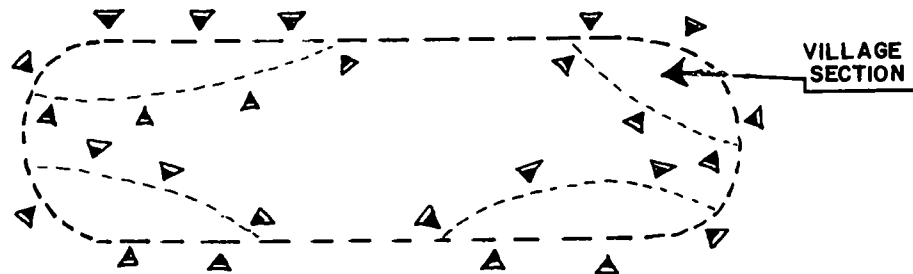
PHASE I**PHASE II**

Figure 5-11. Spearheads

Therefore, the spearhead forces must be alert for ambush and have plans to overcome them. This method of seizure is complete when each assigned section of the village or villages is encircled (see fig. 5-11).

(3) *Phase III, search.* The actual conduct of the search operation will be carried out utilizing those techniques outlined in FM 41-10. The village will be divided into lanes or sectors and a specific unit assigned the responsibility for clearing the area. The headquarters element should be positioned where it can best control the movement of the clearing parties. Members of the reconnaissance element perform local security meas-

ures and act as a small local reserve for the search commander. The fire support element positions itself where it can give fire support to the search elements should it be needed. The blocking force should remain clear of the villages where it cannot be seen. It should be positioned so as to prevent escape attempts by small groups or individuals who try to infiltrate from the village, to counter determined and concentrated breakthrough attempts by enemy forces, and to repulse any attempts by enemy forces to relieve the isolated village. Following the completion of the search, units should withdraw tactically from the village by providing covering elements.

Section VII. RIVERINE OPERATIONS

5-27. General

Most lowland jungle areas have extensive networks of rivers, streams, and swamps. Much of the terrain in the jungle riverine environment is subject to periodic inundation and other areas, such as mangrove swamps, may be permanently inundated. Jungle riverine areas are characterized by very limited or nonexistent overland transportation capabilities, thus making inland waterways the principal means of transportation.

Jungle operations in this area are characterized by the extensive use of water transport, where possible, to move military forces, supplies and equipment. Existing doctrine, as adapted to riverine operations by FM 31-75 (Test) is applicable with modification to the jungle riverine environment. Figures 5-12 through 5-15 portray characteristics associated with rivers located in jungle areas.

5-28. Jungle Riverine Environment

a. A jungle riverine environment is a land environment dominated by water lines of communications. There may be one or more major waterways and an extensive network of lesser waterways. Usable roads are scarce and cross-country movements are drastically curtailed. Although extensive variation is not encountered in the different jungle riverine environments of the world, thorough understanding of a particular environment is essential prior to the conduct of operations.

b. General description of jungle rivers.

(1) *Upper sectors (headwaters)*. Headwaters are usually in a mountainous region drained by numerous large and small tributaries which merge to form a river system. Headwaters are characterized by waterfalls, rapids, and local variations in water depth which limit or restrict the use of watercraft.

(2) *Middle sector (central valley)*. The central valley has a broad river which is usually navigable for great distances inland. The river is usually fed by numerous tributaries. In those jungle areas where there is a definite dry and wet season, many of the tributaries found during the wet season may cease to exist during the dry season. The middle river is wide, slow and often meanders (see fig. 2-3). During periods of heavy rainfall the course of the river is subject to change. Along these wide rivers the jungle stops short of its banks and the canopy appears to come tumbling down to its edge. With the introduction of direct sunlight, the vegetation grows up to form a solid and sometimes impenetrable wall which can be up to 100 meters thick (see fig. 5-12). The banks of the river are often sloped and slippery (see fig. 5-13). Many of the navigable tributaries feeding the major river will often be completely overgrown with vegetation (see fig.



Figure 5-12. Dense vegetational wall along jungle river.



Figure 5-13. Example of steep banks encountered frequently along jungle rivers.

5-14). These tributaries are often interspersed with obstacles such as fallen trees (see fig. 5-15).

(3) *Lower sector (delta)*. The lower sector of a major river system is a flat depositional plain formed by a number of river distributories discharging a great amount of sediment into a gulf, bay or ocean. This area is usually characterized by many large and small tidal streams and channels, whose currents may change speed or reverse with the tide in a roughly predictable manner. Bottoms of the distributories normally slope up to a crest, or bar, at the river's mouth. In some instances, only watercraft with marginal draft will be able to cross it at high tide.

5-29. Special Considerations in the Conduct of Jungle Waterborne Operations

a. The criticality of terrain intelligence and route reconnaissance along jungle waterways places unusually heavy demands on engineer reconnaissance elements. While aerial reconnaissance yields a considerable amount of information, it will have to be supplemented by boat reconnaissance, especially in areas where tributaries are overgrown by vegetation.

b. The heavy vegetation along the banks of inland waterways offers excellent concealment and enhances the effectiveness of ambushing water-



Figure 5-14. Tributary overgrown with vegetation.

craft. Counterambush measures must be planned in conjunction with all water movements. Steep slippery river banks coupled with dense vegetation reduce the possibility of committing the waterborne force in a coordinated maneuver to make an assault landing, thus requiring increased emphasis on water maneuvers to counter the ambush.

c. The lack of adequate landing sites along jungle river banks necessitates extensive prepara-

tory work to facilitate entrance and exit of combat forces.

d. Security measures during the movement phase along a jungle waterway include proper watercraft formations, constant water patrolling, and air observation when possible. Fire support to include artillery, close air support, and available naval gunfire must be preplanned for all water movements.

e. A detailed discussion of waterborne operations can be found in FM 31-75 (Test).



Figure 5-15. Type of navigational obstacle frequently encountered along jungle waterways.

Section VIII. STABILITY OPERATIONS

5-30. General

a. The doctrine for employment of resources in the conduct of stability operations-counter guerrilla operations as contained in FM 100-20, FM 31-23, and FM 31-16 are applicable when modified to meet the conditions of the jungle environment. Stability operations are specifically defined as: that type of internal defense and internal development operation and assistance provided by the Armed Forces to maintain, restore or establish a climate of order within which responsible government can function effectively and without which progress cannot be achieved.

b. It should be noted that major insurgency

movements have occurred in some of the jungle areas described in chapter 2; the jungle areas described are ideally suited for the conduct of insurgency and guerrilla operations.

5-31. Influencing Factors

a. Regardless whether a unit is conducting counter guerrilla operations in a stability operation or in any other type action, the jungle remains the same with its many influencing factors. These influencing factors will always include vegetation, climate, weather, mobility and natural obstacles. The effectiveness of military combat units in stability operations is determined by

their intelligence capability, mobility, firepower differential, communication capability and ability to operate in the field on an austere support basis. The ultimate composition of forces is influenced by the size and capability of the opposition force, lines of communication and the nature of the terrain. Infantry, airborne and airmobile units possess the characteristics and qualities especially suited for this type of operation in a jungle environment; however, in many situations, armor and mechanized units can be used to advantage.

b. Operational plans for combatting guerrilla forces in a jungle environment is covered in detail in references listed above. However, some modifications of these techniques may be required at times because of the jungle environment or because of restrictions imposed upon a commander by a host government and the political situation. When restrictions are imposed, the commander must revise his tactical doctrine to fit those conditions, yet he must not lose sight of his ultimate mission which is to find and destroy the enemy. During all stability operations, commanders must not lose sight of the overall objectives of the stability effort. Military and paramilitary action against insurgent forces are only a part of the overall internal defense and development effort. The defeat of the hostile armed forces does not guarantee victory; the deciding factor in the success of the stability effort is the reconciliation between the insurgents and the government in power. Therefore, since the ultimate objective of all internal defense forces is to gain the loyalty of the people for their government, every military action must be planned and evaluated with full recognition of its political consequences. Extreme care must be taken to insure that military operations do not alienate the masses of the people to a point where such reconciliation is impossible.

c. One of the first considerations of the government must be the protection of the people from insurgent ravages and reprisals. Often the employment of forces to this end denies the commander those troops required to conduct effective military operations against the guerrilla. Regardless of the other measures taken to improve conditions and otherwise gain population support, unless the people know they will be protected from insurgent coercion and acts of terror, their response to other government overtures will be minimal. Therefore, basic operations must provide for the establishment of relatively secure and stable environmental areas within the country in

which internal development and other measures aimed at gaining population support can be conducted effectively.

d. In jungle areas the population normally is concentrated along the coastal regions and major communications centers with villages and hamlets dispersed along the periphery of the jungle. The jungle itself is normally occupied by primitive tribes. The people along the periphery of the jungle and the tribes therein have little allegiance to a central government and are subject to persuasion, coercion and intimidation by the guerrilla forces. Unless the government can protect these people from the guerrilla terror tactics, they cannot hope to gain their support. One concept which may differ from conventional warfare is the guerrilla use of base camps in support of their operations. The very characteristic of the jungle environment provides the insurgent with numerous areas for the construction of secure base camps because of the excellent cover and concealment. The relatively inaccessible terrain restricts the full application of the firepower normally available to a conventional force and provides the insurgent with his lightly equipped, foot mobile force, an advantage over conventional units. Also, the intelligence gathering capability of the conventional force is restricted due to low population density within the jungle and the degradation of surveillance and other intelligence gathering systems (e.g., radar, aerial photography, and aerial reconnaissance).

5-32. Base Camps

a. The tactical success of the guerrilla in stability operations is based primarily upon his ability to assemble quickly, strike and retreat to a sheltered or protected base camp. The jungle base camp, therefore, is critical to the guerrilla operations. From the base camp he launches his attacks and to the base camp he returns for security and fitting. His mobility depends to a great deal upon a chain of secure base camps. Therefore, finding and destroying jungle base camps and the forces therein is paramount to counter-guerrilla force operations. Base camps are often well organized, well fortified and usually surrounded with mines and other warning and delaying devices.

b. Once the jungle base camp is discovered it is attacked using the same techniques as those employed in the attack on any fortified position in a jungle environment. There are four operational problems involved in attacking base camps: (1)

finding the base camp; (2) attacking a fortified position; (3) destroying the guerrilla forces before they escape; and (4) destroying the extensive networks of earthworks and reinforced tunnels. These camps must be destroyed as the guerrilla will return to them once the pressure in the area of operation is relieved. Yet, few units have either time or organic means to destroy even a small percentage of the base camps they find. Destruction of base camps requires time, manpower, equipment and large amounts of explosive. When time permits, the job can best be done by plows, bulldozers, chain saws, shaped charges and explosives. When time does not permit, methodical, complete destruction by troops on the ground, the base camp should be marked for easy aerial observation. Then the base camp should be systematically opened up to observation and destroyed by a program of aerial defoliation, air strikes with napalm and heavy bombs, and by artillery firing fuze delay. A destruction program of this nature over a period of time will systematically reduce the jungle area available as a refuge and inhibit the guerrilla's mobility which depends upon these base camps.

5-33. Operations

a. Counterguerrilla operations in a jungle environment are characterized by close combat at ex-

tremely short range (often 20 to 50 meters) and by widespread tactical offensive operations by units varying from platoon to multidivisional size. The combat operations are logistically supported from semipermanent base camps widely located throughout most regions of the country. These unit base camps, in turn, are dependent upon large scale logistical installations established near or in communication centers and deep water ports. Tactical offensive operations have the general goal of locating and destroying the enemy armed forces as opposed to the seizure of terrain objectives; concurrently, forces must provide security to their own base camps and supporting logistical installations. As previously stated, all offensive and security operations must be undertaken within the broader goal of restoring government control over the population so that nation building can progress.

b. Tactical operations normally conducted in stability-counterguerrilla operations are outlined in FM 31-23 and FM 31-16. These tactical operations are fully applicable when adapted to meet the conditions prevalent in a jungle environment.

c. Those capabilities and limitations of combat and combat service support elements discussed in other sections of this manual are equally applicable and must be considered when conducting stability-counterguerrilla operations in a jungle environment.



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CHAPTER 6

SPECIAL TRAINING REQUIREMENTS

Section I. INDIVIDUAL AND UNIT TRAINING

6-1. General

Actual jungle conditions constitute the ideal training situation, when jungle terrain is not available, dense woods, river beds, swamps, marshes or thickets can be used effectively for training. Application of night fighting techniques is effective in simulating the reduced ranges of assault, restricted movement, and control difficulties imposed by the jungle.

6-2. Training Objectives

a. The objectives of jungle training are to prepare the individual and unit to function effectively in jungle environments. Training situations should be created which require execution of missions by small units operating independently. Control of units should be decentralized, requiring reliance upon small unit leaders and the individual soldier. Training should demand individual self-reliance, teamwork, skill and termination on the part of participating troops. The scope of the training program should extend from survival of the individual in the jungle, to participation of units in combined operations.

b. Troops must be physically conditioned to operate in the high heat and humidity of the jungle environment. In addition, they must be psychologically conditioned to eliminate the common

fears associated with the jungle (snakes, insects, animals).

6-3. Training Priorities

a. *First Priority.* Individual and unit proficiency should be attained in the following subjects and skills:

- (1) Patrolling.
- (2) Day and night land navigation.
- (3) Target detection and engagement.
- (4) Ambush and counterambush.
- (5) Perimeter defense in jungle terrain.
- (6) Immediate action drills.
- (7) Village search and seizure operations.

b. *Second Priority.* The following subjects should be integrated into all individual and unit jungle training:

- (1) Jungle living.
- (2) Field sanitation and personal hygiene.
- (3) Supply and evacuation techniques.
- (4) Boat drill and use of jungle waterways.
- (5) Guerrilla weapons, mines and traps.
- (6) Airmobile movements.
- (7) Tracking techniques.
- (8) Terrain orientation.
- (9) Individual maintenance of weapons, clothing and equipment.
- (10) CBR operations.

Section II. JUNGLE LIVING

6-4. General

It is essential that the individual soldier be conditioned to the peculiarities of the jungle environment in which they are to operate; otherwise, they are liable to become occupied solely with their surroundings and give little attention to the assigned mission. Jungle operational training should emphasize the importance of individual resourcefulness, imagination, and determination. The soldier should acquire and apply sound habits to the everyday routine of living in the jungle.

6-5. Conditioning and Acclimatization

a. Commanders must give consideration to the physical conditioning and acclimation of his troops. Men must be in the best possible physical shape prior to initiation of jungle operations and should be given a minimum of 7 days after arrival in the tropics to become acclimated to the heat and humidity. The acclimation process is automatic and begins the first day of arrival in the tropics. The ease and rapidity with which the body becomes acclimated depends upon degree of tem-

perature change between the two climates involved. Troops from a southern location in the mid-latitudes will become acclimated easier than troops from a place farther to the north. Troops which are transported to tropical areas by surface transportation will not experience as much discomfort when they arrive as would troops which are transported by air. The body will remain acclimated from one to two weeks after departure from a tropical environment.

b. The foreboding appearance of the jungle, oppressive humidity and heat, unfamiliar noises and abject feeling of loneliness that one feels when entering the jungle intensify the already existing fear of the unknown. To overcome these fears and uncertainties, commanders must condition the soldier's mind for this new experience. The soldier must be given confidence in his ability to live, move and operate in the jungle. Good physical conditioning will enable him to face physical hardships. He must be trained in techniques of survival and in the techniques of sustained operations over long periods of time. Only through systematic and thorough training will the soldier come to realize that the jungle is neutral and can be made to work for him against the enemy.

c. Heat disorders in the tropics.

(1) *General.* Heat disorders are a serious problem in the tropics. Troops must be trained in the causes and symptoms and prevention of heat exhaustion and heat stroke as outlined in FM 21-10.

(2) *Heat exhaustion.* Heat exhaustion is caused by excessive loss of water and salt from the body. Commanders must insure that there is ample water available and that troops drink enough to avert heat exhaustion. During normal operations, soldiers should drink from 6 to 15 canteens of water a day, depending upon how much the individual sweats.

(3) *Basic rules for prevention of heat disorders.*

(a) Troops should drink plenty of water.

(b) Soldiers must become acclimated.

(c) Troops should use extra salt with food and water. Both salt and water are needed to prevent all heat disorders.

(d) Soldiers should eat their heavy meal during the cool of the day if this is possible. Food is an important source of salt for the body.

(e) Troops should dress properly for heat.

6-6. Individual Clothing and Equipment

a. *Combat Uniform (Fatigues).* This uniform is adequate, as issued, for wear in the jungle. While jungle fatigues are best suited for jungle terrain, if other fatigues are worn, they must fit loosely. To aid ventilation, troops should be allowed to wear the jacket on the outside of their trousers. To take advantage of the blending color of fatigues with the background offered by the jungle, the clothing should not be excessively faded from the original olive green color. Worn or threadbare clothing will not protect the soldier from insect bites, brambles, and direct sunlight as well as new cloth. Troops should avoid wearing underwear as it may irritate the skin and reduce ventilation.

b. *Footwear.* The lightweight jungle boot with cleated sole is the preferred footwear for operations in the jungle. When combat boots are used, the soles should be cleated. Boots should be taken off at every opportunity to allow for drying of feet and boots, and for application of foot powder.

c. *Headgear.* A utility hat is recommended for wear on all operations where stealth is required because of the noise caused by the steel helmet in dense vegetation.

d. *Gloves.* If available, soldiers should wear gloves when moving through vegetation to provide protection from thorns, brambles, insect bites and snake bites. Gloves will also protect the hands from blisters when using the machete for prolonged periods of time and will prevent burns when rappelling rapidly. When not actually needed, gloves should not be worn because they will soften the skin unnecessarily.

e. *Suspenders.* The suspenders issued with the combat pack should be worn when the belt is worn. Troops should not wear the combat pack unless the mission dictates. Individual equipment and ammunition should be worn on the belt.

f. *Machete.* The machete is an indispensable aid to the jungle fighter in moving through thick jungle and for construction purposes. It is an effective weapon as well as an excellent cutting tool.

g. *Bayonet.* Each soldier should be equipped with a bayonet. There are many varied uses to which this knife can be put. A hunting knife or pocket knife can be used in addition to a bayonet.

h. *Compass Magnetic.* The small unit leader should always carry a compass in the jungle. It

should be worn high on the shoulder to prevent it from coming in contact with mud and water. It should be secured to the suspenders by a string.

i. *Climbing Rope and Snap Links.* These two pieces of equipment are required for negotiating the numerous obstacles encountered in the jungle. Each platoon should carry a minimum of 120 feet of rope and each individual should carry a snap link.

j. *Canteen.* While water is available in the jungle, it is usually of questionable potability. Therefore, each soldier should carry two canteens, one being used for drinking while the water in the other is in the process of being purified.

k. *Insect (Mosquito) Bar.* The mosquito bar is an important item of equipment. It should be rolled inside the poncho which can be fastened onto the top of the combat pack, or attached to the suspender harness with light rope. The mosquito bar should be utilized whenever troops sleep in the jungle. If conditions prevent construction of a shelter the bar can still be used by tying it to trees or brush. Besides providing protection from insects, the mosquito bar will offer protection from bats, whose bites are a potential source of rabies. Troops should not allow any portion of the body to contact the mosquito bar when it is hung, as mosquitos and bats will bite through the net.

l. *Poncho.* When the poncho is worn as a raincoat in the jungle, its nonporous structure will cause perspiration and will cause the soldier to be more uncomfortable, and wetter, than he would be if he did not attempt to clothe himself against the rain. Also, the vegetation at times will literally tear the poncho from the wearer's body. The poncho as an expedient has many useful purposes. It can be used to construct shelters and rafts and it can be used as a sleeping bag, mattress and an improvised parachute for aerial delivery of materiel.

m. *Others.* Additional items of equipment which are useful in the jungle are—

- (1) Map case.
- (2) Map protractor.
- (3) Whistle.
- (4) Waterproof flashlight.
- (5) Waterproof watch.

6-7. Health, Hygiene and Sanitation

a. *Hygiene and Sanitation.* In no other type of military operation is sanitation and personal hygiene more important than in the jungle for diseases can quickly neutralize the fighting potential

of an entire command. Commanders at all levels must enforce high standards of military sanitation and personal hygiene. Since the jungle favors operations by small units, every soldier must have at least an elementary knowledge of how to care for his own health. See FM 21-10 and FM 21-76 for additional information; and the appropriate TB MED for clinical features, treatment, control and prevention of specific diseases.

b. *Tropical Diseases.* All tropical areas, due to their warm and humid climates, favor rapid reproduction, growth, and spread of disease causing germs. Most of these areas have a high rate of endemic diseases; the primitive sanitation systems and great numbers and varieties of disease carrying insects compound this condition. It would not be possible or practical to discuss the subject of tropical diseases at any great length. However, a basic knowledge of the disease conditions, their cause and method of spreading, and their prevention is necessary. The communicable diseases will be categorized by their method of transmission. There are four major groups of these diseases: contact, intestinal, waterborne, and insect and animal borne.

(1) *Contact diseases.* As the name implies, these diseases are spread by personal or direct contact. Examples of these are venereal disease and smallpox.

(2) *Intestinal infections.* These diseases are usually transmitted by eating contaminated food or drinking untreated water. Contamination of food is common. The contamination may be caused in vegetable products by contact with infected material during growth, such as human excrement used as fertilizer. Contamination of any food may be caused by dirty utensils, flying insects, or by food handlers who have, or are carriers of, intestinal diseases. Some of the parasitic intestinal infections (such as hookworm) are acquired through the skin by walking barefoot.

(3) *Waterborne diseases.* These diseases may be transmitted by impure water which is used for drinking, cooking and bathing purposes. Some examples are typhoid fever, salmonellosis, bacillary dysentery, ambiasis, cholera, and schistosomiasis (blood fluke), which may be readily encountered in surface water while bathing (entrance may be through any minute break in the skin) or swimming, and through drinking.

(4) *Insect and animal borne diseases.* Insect and animal borne diseases are transmitted from man to man directly through bites of blood-sucking insects or animals. The germ may be introduced into the human bloodstream or tissues

by the bite of the infected insect or it may be deposited upon the skin by defecation or during the process of biting. In the latter two instances, scratching the insect bite infects the wound with the germs. Diseases transmitted by mosquitoes include malaria, yellow fever, dengue (break-bone) fever, filariasis (elephantiasis), and some forms of encephalitis. Ticks transmit tick born typhus, rabbit fever, tick paralysis, and relapsing fever. Sand flea bites can produce various diseases such as tropical and oriental sores. Fleas may convey the bubonic plague (rat flea) and marine typhus; scrub typhus is transmitted by small mites. Body and head lice may transmit epidemic typhus fever and relapsing fever. Mites, blood sucking flies, kissing bugs, and bats can convey diseases and rabies to human beings by their bite. Insect repellant and impregnated uniforms are effective in preventing many of these diseases.

(5) *Fungus diseases.* These diseases merit additional consideration because they are so serious in the jungle as the climate favors the growth of microscopic plants called fungi which produce these diseases. Also, sweat-soaked skin invites attack by fungus. Ringworm, athlete's foot, and trichophytosis, a fungus disease of the hair, are the principal fungus diseases.

c. *Countermeasures (Preventive).* There are various countermeasures that each soldier can apply to protect himself from these diseases:

(1) First and foremost, the soldier should assume personal responsibility for his own cleanliness and the sanitation of his environs.

(2) Inspect his body frequently for lice, ticks, or other insect bites (use the "buddy system").

(3) Inspect his body for skin breaks, lacerations and scratches, and more important, treat them immediately. Due to the excessive heat and humidity, the body will sweat profusely and this moist condition often causes a minor scratch or skin laceration to become infected and not heal.

(4) Avoid contact with the natives, never sleep in native huts or have intimate relations with native women. The VD rate is quite high in the tropics and is a serious problem.

(5) Protect the body from insect bites by using the mosquito bar. Use latrines where possible, and keep the base camp or bivouac area well policed.

(6) Bathe frequently and air or sun-dry the body as often as the situation allows.

(7) Wear clean, dry, loose fitting clothes when possible.

(8) Avoid wearing underwear if at all possible; this is known as the single layer principle.

(9) Keep the hair cut short and shave frequently.

(10) Remove boots and massage the feet as often as possible, and when the tactical situation permits, always remove the boots while sleeping.

(11) While at semipermanent camps, brush and vegetation should be removed and insecticides should be applied as directed by medical service officers. Each individual should apply skin repellant to exposed areas and to the uniform over areas of skin contact (shoulders-knees) and use insecticide aerosols around sleeping area, and when indicated, wear clothing impregnated with repellant. Whenever possible, sleeping should be off the ground in a hammock or on a platform.

(12) Each soldier should dust his feet, socks and boots with foot powder at every opportunity.

(13) The individual responsibility for personal health cannot be overemphasized. However, this also falls within the command responsibility at every echelon. Frequent and detailed inspections by the junior leaders to insure that each soldier takes proper preventive hygienic measures will reduce the number of soldiers ineffective due to health reasons.

d. *Water.*

(1) *General.* Every effort should be made to obtain water from an approved water point. An abundance of water can be found in the jungle; however, all water obtained from other than an approved source must be purified before it is consumed. Streams and rivers, waterholes, and some vines will furnish water. Banana tree stalks, wrung out like a wet cloth, are a source of water. Bamboo saplings contain a supply of water in the lower sections. Rain is a good source of water, however, the jungle canopy is inhabited by thousands of creatures. Troops should wait for rain to fall for 15 to 30 minutes to insure that water that falls through the canopy is free from contamination caused by excretion of these creatures.

(2) *Tests and purification.* If a vine is used for a source of water, certain tests should be made to determine its potability. A segment of large vine should be cut in a length of about three feet and notched to get the water flowing. If the liquid is a white sap or very dark in color, it is not drinkable. If the liquid is clear, test it for odor. If it is slightly pink or red in color this normally indicates the presence of tannic acid. If the liquid smells bad, like turpentine or some other offensive smell, then discard it. If it is odor-

less, test it for taste. If the liquid burns the tongue or tastes bitter, discard it. If it has no taste or doesn't taste bad, then it is a good source of water. Special care must be taken against waterborne diseases. All water, except the water from vines, bamboo and banana plants, must be purified prior to consumption. Boiling, for at least one minute plus an additional minute for every 1,000 feet above sea level, or chemical purification by halazone or iodine tablets is necessary. One iodine tablet in clean water, two for muddy water for thirty minutes and three for paddy water is sufficient for purifying the water.

6-8. Jungle Materiel

The jungle contains a large amount of native materials that can be used for construction, positions, shelters, obstacles and survival. Troops should be trained in the construction and use of shelters and in the use of field expedients made from jungle materials.

6-9. Tropical Plants and Foods

See FM 21-76 for information on types, identification, edibility tests and preparation of plants and foods found in the jungle.

6-10. Tropical Hazards

a. General. Troops should be familiarized with what forms of life in the area in which they are operating constitute hazards, how to recognize them, and what precautionary measures can be taken. Tropical hazards are only discussed in general terms in this manual. They are covered in detail in FM 21-76.

b. Insects. The greatest hazard of the tropics is the insects. The intense heat, high humidity, heavy rainfall and incidence of low swamp land coupled with dense vegetation of the jungle constitute an ideal environment for insects. The greatest danger is the ability of insects to transmit weakening and frequently fatal diseases through their bites. The bites also constitute a serious threat to health by promoting infections as scratching an insect bite will generally cause an infection if no medication is applied. Emphasis must be placed on exercising basic preventive

measures and supervision at small unit level. Careful attention to food and water, personal cleanliness, and keeping the body well covered will reduce the incidence of non-battle casualties from insects. For a discussion of diseases caused by insects, see paragraph 6-7.

c. Poisonous Snakes. Fear of snakes, which is common among men, is largely a result of misinformation and unfamiliarity. Actually, only a small portion of all snakes in the tropics are poisonous and they are seldom seen even by men engaged in jungle combat. Familiarization with the habits of snakes, how to identify poisonous snakes of the area, simple precautions to prevent snake bites, and appropriate first aid measures in the very rare emergency of being bitten, will do much to eliminate a soldier's fear.

d. Marine Life. Marine life which constitute a hazard in tropical areas are poisonous, venomous, and ferocious fish; crocodiles and caymen; sea urchins; and coral, which can inflict painful cuts. Caution must be exercised in fording and bathing in jungle streams because of the danger posed by cayman and crocodile. Troops should be made aware of any water hazards peculiar to an operational area.

e. Mammals. The types of animals one can expect to encounter will depend on the jungle region and the type of vegetation. The larger and more dangerous animals are found in the grasslands along the periphery of the jungle. With few exceptions, animals of the jungle and its surrounding areas, will withdraw from any encounter with man. A familiarization with the wild inhabitants of the jungle and their habits will contribute to the soldier's understanding of the surroundings in which he must fight.

f. Poisonous Plants. As a rule, poisonous plants are not a serious hazard in the jungle. The two general types of poisonous plants are those poisonous to touch and those poisonous to eat. In tropical regions several kinds of plants poison by contact. There are also varieties of plants with stinging hairs which generally do not constitute a real danger; however, their sting, due to formic acid, is painful. The varieties of poisonous and stinging plants will vary in different jungle areas. Troops should be able to recognize them and avoid them whenever possible.

Section III. TRACKING

6-11. General

In jungle operations friendly forces may be confronted by an enemy force which is native to a

particular area and who has an intimate knowledge of the terrain. Troops conducting jungle operations (particularly counter guerrilla opera-

tions) should be proficient in the techniques of tracking. An ability to track and to correctly interpret signs will enable troops to detect the presence of an enemy, to follow them, locate and avoid mines and boobytraps, and give early warning of ambushes. Consideration must also be given to countermeasures to prevent the enemy from utilizing tracking techniques against the friendly forces.

Section IV. TARGET DETECTION AND ENGAGEMENT

6-13. General

In dense jungle, targets are rarely visible except at close range and normally will be irregularly spaced. The availability of vegetation for concealment and ground folds, rocks, large trees, and hardwood roots for cover make detection very difficult. Troops must use proper search techniques in order to discover, attack and destroy the enemy.

6-14. Detection

The employment of all the senses takes on added significance when attempting to detect personal targets in dense jungle, especially at night. During hours of daylight, targets will be detected primarily by sight. Troops must receive training on proper search techniques and must not allow their eyes to concentrate on any single tree or vine. They must look through the vegetation as one looks through a dirty automobile windshield to concentrate on the road ahead. Emphasis must be placed on looking for things that don't blend in with the foliage, such as a man's boot, pistol belt, face and hands. During hours of darkness, key factors in detecting targets are: sense of smell, hearing and touch; and characteristic

6-12. Tracking

Tracking is the art of following the path of man or beast by his residual odor and/or by reading the disturbances of the ground, vegetation or animal life. There are two separate but complementary methods of following a track: visual tracking and scent tracking. The principal tracking sources are: native trackers, scout dogs, and troops. For details on tracking techniques, see FM 20-20.

odors given off by enemy troops, such as the smell of garlic, curried rice, widely used sauces, and pungent tobaccos or narcotics. Soldiers must become accustomed to the characteristic sounds of the jungle and learn to distinguish these noises from those made by the enemy. Troops unfamiliar with the sounds of the jungle can cause a fire fight among friendly forces at night or give away unit positions by firing at these noises. A knowledge of the enemy's ethnic characteristics, clothing and equipment will enable a soldier to identify the enemy by touch.

6-15. Engagement

Once the target has been detected, troops must react instinctively to it. Targets detected by any means will usually be seen only for a few moments and must be taken under fire and attacked immediately. The nature of the target and the terrain may favor one firing position over another. When the vegetation is exceedingly dense, troops may be forced to engage the enemy rapidly by firing from the hip. Before conducting operations in dense jungle, troops should receive intensive training in "quick kill" firing as well as reaction firing.

APPENDIX A

REFERENCES

A-1. Army Regulations (AR)

- 310-25 Dictionary of United States Army Terms.
310-50 Authorized Abbreviations and Brevity Codes.

A-2. Department of the Army Pamphlets (DA Pam)

- 310-1 Military Publications, Index of Administrative Publications.
310-3 Military Publications, Index of Doctrinal, Training and Organizational Publications.
310-4 Military Publications, Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8 and 9), Supply Bulletins, and Lubrication Orders.

A-3. Field Manuals (FM)

- 1-5 Aviation Company.
1-100 Army Aviation Utilization.
3-10 Employment of Chemical and Biological Agents.
3-12 Operational Aspects of Radiological Defense.
3-50 Chemical Smoke Generator Units and Smoke Operations.
5-1 Engineer Troop Organizations and Operations.
5-15 Field Fortifications.
5-30 Engineer Intelligence.
5-31 Boobytraps.
5-34 Engineer Field Data.
5-35 Engineers' Reference and Logistical Data.
5-36 Route Reconnaissance and Classification.
6-20-1 Field Artillery Tactics.
6-20-2 Field Artillery Techniques.
7-11 Rifle Company, Infantry, Airborne, and Mechanized.
7-15 Rifle Platoon and Squads, Infantry, Airborne, and Mechanized.
7-20 Infantry, Airborne Infantry, and Mechanized Infantry Battalions.
7-30 The Infantry Brigades.
8-10 Medical Service, Theater of Operations.
8-15 Medical Service in Divisions, Separate Brigades, and the Armored Cavalry Regiment.
8-35 Transportation of the Sick and Wounded.
9-6 Ammunition Service in the Theaters of Operation.
10-8 Airdrop of Supplies and Equipment in the Theater of Operations.
10-63 Handling of Deceased Personnel in Theaters of Operation.
12-2 Adjutant General Support in Theaters of Operations.
14-3 Comptroller Support in Theaters of Operations.
17-1 Armor Operations.
19-30 Physical Security.
19-40 Enemy Prisoners of War and Civilian Internees.
20-20 Military Dog Training and Employment.
20-32 Landmine Warfare.

20-33	Combat Flame Operations.
21-10	Military Sanitation.
21-11	First Aid for Soldiers.
21-18	Foot Marches.
21-26	Map Reading.
21-30	Military Symbols.
21-31	Topographic Symbols.
21-40	Chemical, Biological, Radiological, and Nuclear Defense.
21-41	Soldier's Handbook for Defense against Chemical and Biological Operations and Nuclear Warfare.
21-50	Ranger Training and Ranger Operations.
21-60	Visual Signals.
21-75	Combat Training of the Individual Soldier and Patrolling.
21-76	Survival, Evasion and Escape.
21-77	Evasion and Escape.
23-17	Redeye Guided Missile System.
23-30	Grenades and Pyrotechnics.
23-71	Rifle Marksmanship.
23-92	4.2-inch Mortar, M30.
24-18	Field Radio Techniques.
24-20	Field Wire and Field Cable Techniques.
24-21	Field Radio Relay Techniques.
29-30	Maintenance Battalion and Company Operations in Divisions and Separate Brigades.
30-5	Combat Intelligence.
30-10	Terrain Intelligence.
30-20	Aerial Surveillance-Reconnaissance, Field Army.
31-12	Army Forces in Amphibious Operations (The Army Landing Force).
31-16	Counter guerrilla Operations.
31-21	Special Forces Operations—U.S. Army Doctrine.
31-22	U.S. Army Counterinsurgency Forces.
31-23	Stability Operations—U.S. Army Doctrine.
31-36 (Test)	Night Operations.
31-45	Explosive Ordnance Disposal Service.
31-50	Combat in Fortified and Built-up Areas.
31-60	River-Crossing Operations.
31-72	Mountain Operations.
31-73	Advisor Handbook for Stability Operations.
31-75 (Test)	Riverine Operations.
33-1	Psychological Operations—U.S. Army Doctrine.
41-10	Civil Affairs Operations.
44-1	U.S. Army Air Defense Artillery Employment.
55-4-1 (Test)	Transportation Movements in a Theater of Operations.
55-6-1 (Test)	Transportation Services in a Theater of Operations.
55-20	Army Rail Transport Operations.
55-30	Army Motor Transport Operations.
55-46	Army Air Transport Operations.
55-55-1 (Test)	Transportation Terminal Operations.
57-35	Airmobile Operations.
61-100	The Division.
100-5	Operations of Army Forces in the Field.
(C) 100-20	Field Service Regulations—Internal Defense and Development (IDAID) (U).
100-27	U.S. Army/U.S. Air Force Doctrine for Tactical Air Lift Operations.

101-40

Armed Forces Doctrine for Chemical and Biological Weapons Employment and Defense.

A-4. Training Circulars (TC)

3-16 Employment of Riot Control Agents, Flame, Smoke Anti-plant Agents, and Personnel Detectors in Counterguerrilla Operations.

A-5. Technical Manuals (TM)

1-300 Meteorology for Army Aviation.
3-215 Military Chemistry and Chemical Agents.
3-216 Military Biology and Biological Agents.
3-220 Chemical, Biological and Radiological (CBR) Decontamination.
3-240 Field Behavior of Chemical, Biological and Radiological Agents.
5-210 Military Floating Bridge Equipment.
5-270 Cableways, Tramways and Suspension Bridges.
5-277 Bailey Bridge.
5-312 Military Fixed Bridges.
5-330 Planning and Design of Roads, Airbases, and Heliports in the Theater of Operations.
5-530 Materials Testing.
9-1300-206 Care, Handling, Preservation and Destruction of Ammunition.
9-1900 Ammunition, General.
11-666 Antennas and Radio Propagation.



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Yellow fever	2-9, 2-20 <i>b</i>	2-16, 2-22

By Order of the Secretary of the Army:

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Distribution:

To be distributed in accordance with DA Form 12-11 requirements for Jungle Operations.





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